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Hydroacoustic Herring Survey Results From Hecate Strait December 3-15, 1990. *W. E. Ricker* Cruise 90HER2

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HYDROACOUSTIC HERRING SURVEY RESULTS FROM HECATE STRAIT DECEMBER 3-15, 1990. W. E. RICKER CRUISE 90HER2

by

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ABSTRACT

McCarter, P. B., P. Withler, D. E. Hay, and R. Kieser. 1991. Hydroacoustic herring survey results from Hecate Strait, December 3-15, 1990. W. E. RICKER cruise 90HER2. Can. Manuscr. Rep. Fish. Aquat. Sci. 2108: 69 p.

Two major Pacific herring overwintering areas in Hecate Strait are Juan Perez Sound, in the Southern Queen Charlotte Islands and the vicinity of Browning Entrance on the mainland side of Hecate Strait. Echo integration biomass estimates of midwater herring totalled 15,235 tonnes in the Browning Entrance area and 32,575 tonnes in Juan Perez Sound. The effects of bottom echo interference during the day and a limited echo integration range near the surface at night were mitigated during this survey by sounding during a 6-8 hour period at dusk and dawn. Six repeated soundings in Juan Perez Sound gave a measure of the variability of the hydroacoustic biomass estimates over 3 successive evenings. The biomass estimates determined during this survey are similar to those determined by other stock assessment methods.

Key words: Pacific herring, Hecate Strait, hydroacoustic, biomass estimate, survey

RÉSUMÉ

McCarter, P. B., P. Withler, D. E. Hay, and R. Kieser. 1991. Hydroacoustic herring survey results from Hecate Strait, December 3-15, 1990. W. E. RICKER cruise 90HER2. Can. Manuscr. Rep. Fish. Aquat. Sci. 2108: 69 p.

Il y a deux importantes zones d'hivernage pour le hareng du Pacifique dans le détroit d'Hecate, l'une est le détroit de Juan Perez, dans les îles de la Reine-Charlotte sud, et l'autre se trouve au voisinage de l'entrée Browning du côté de la terre ferme du détroit d'Hecate. Les estimations de la biomasse de hareng semi-pélagique à l'aide de l'écho-intégrateur totalisaient 15 235 tonnes dans l'entrée Browning et 32 575 tonnes dans le détroit de Juan Perez. Les effets de l'interférence de l'écho de fond pendant le jour et de l'intervalle restreint de l'écho-intégrateur près de la surface durant la nuit, ont été atténués pendant cette étude grâce à des sondages pendant une période de 6-8 heures à l'aube et au crépuscule. Six sondages répétés dans le détroit de Juan Perez ont permis de mesurer la variabilité des estimations hydroacoustiques de la biomasse pendant 3 soirs successifs. Les estimations de la biomasse pendant cette étude sont semblables à celles obtenues par d'autres méthodes d'évaluation des stocks.

Mots clés: hareng du Pacifique, détroit d'Hecate, hydroacoustique, estimation de la biomasse, étude

INTRODUCTION

The objective of this survey was to examine the feasibility of obtaining hydroacoustic estimates of Pacific herring (Clupea harengus pallasi). Midwater trawl tows were conducted to obtain herring samples and to confirm species composition of major aggregations determined by echogram interpretation. Survey grid patterns were based on the experience gained from previous winter acoustic and fishing surveys in 1984 (Kieser et al. 1987), 1985 (McCarter et al. 1987), 1987 (McCarter et al. 1988) and 1988 (McCarter et al. 1989). This survey contributes to the Hecate Strait Project in which the overall objective is to map fish assemblages and develop an ecological basis for mixed-species assessment and management techniques. The survey was conducted by the W. E. RICKER and a schedule is given in Appendix Table 1.

The hydroacoustic biomass estimates determined during the survey are derived statistically rather than empirically and are compared with other statistical stock estimates which are based on spawn surveys and analyses of catch and age structure (Haist and Schweigert, 1991). The hydroacoustic estimate is independent from these other methods and represents the best available hydroacoustic estimate in view of the dynamic behaviour of herring and the time and resources available.

METHODS

HYDROACOUSTIC EQUIPMENT

The hydroacoustic equipment installed on the W. E. RICKER was configured for echo integration. Its major components were a Biosonics model 101 (1985) echo sounder, Biosonics model 121 (1979) echo integrator and a Biosonics model 111 (1985) chart recorder. The measured echo intensity data were processed on an IBM PC compatible microcomputer and analog data were recorded on VHS video cassette tapes. An 8 by 13 degree, Simrad (#4318) 38 kHz ceramic transducer was mounted in a torpedo-shaped body which was towed behind the vessel to minimize interference. The echo sounder, transducer and cable were calibrated at the hydroacoustic barge of the University of Washington, Seattle, August 1990. A fish target strength of -32 dB/kg was used to convert the measured backscattering strength to fish density estimates. Biomass estimates were obtained by extrapolating the measured surface density over the area of interest.

SURVEY AREA

Parallel transects 3-10 nm in length were spaced 1.0 nm apart in Browning Entrance and 0.5 nm apart in Juan Perez Sound. Transect grids were

completed in a 6-8 hour period primarily at dusk and dawn when most herring were in midwater schools. This was especially important in the deeper waters of Juan Perez Sound where fish are difficult to distinguish from bottom during the day and much of the biomass is shallower than the towed body at night. Separate transect grids were completed on four major fishing grounds in the Browning Entrance area. Figure 1 shows the locations of the transect grids on the Freeman's ground, Whiterocks ground, Bonilla ground and inshore Browning Entrance ground. The Freeman's transect grid was surveyed twice. One survey was done during full daylight and the other at dusk. Figure 2 shows the locations of the Juan Perez area grids. One transect grid was done at dawn and dusk over 3 successive evenings in Juan Perez Sound and another grid was done once at the sound's entrance.

The transducer was towed at a depth of 10-15 meters while the ship's speed was maintained at 8-10 knots. The echo integration range or depth strata selected in the Browning Entrance area included the entire water column starting 5 m below the transducer to 4 m from the sea floor. In the deeper waters of Juan Perez Sound the integration range was set starting 5 m below the transducer to a maximum depth of 140 m from the transducer or to 10 m from the sea floor over shoals. These depth strata were chosen to maintain bottom tracking over irregular bottom, to minimize bottom echo integration, to avoid transducer near field effects and to avoid inclusion of other fish species in the herring biomass estimate.

FISHING AND SAMPLING

Fishing equipment on the W. E. RICKER included a Canadian Diamond 5 midwater trawl with 40 fathom sweeplines and 3 m^2 Suberkrub otter boards. Catches were brought aboard and species weights estimated. Herring samples were placed in buckets and frozen. Species catch compositions were interpreted and applied to hydroacoustic biomass estimates after echograms were closely examined. Scales for age determinations were later removed from 100 herring in each sample. Herring standard length measurements were recorded to the nearest millimetre, fish weights and gonad weights to the nearest gram and sex and maturity determined whenever possible.

HYDROACOUSTIC DATA PROCESSING

Average echo intensity values measured by the echo integrator over one minute intervals (sequences) and by selected depth strata were logged by a microcomputer. An event file was logged concurrently on another microcomputer by entering the event number, time, position, sequence number and analog tape number at the start and end of each transect. A set of BASIC programs were used to perform calculations for biomass estimation and to produce biomass distribution plots. The calculated parameters included transect bearing, transect length (km), average speed (kn), area covered (km^2), biomass centroid

depth (m), volume density (kg/m^3), surface density (kg/m^2) and cumulative biomass (t). Further detail regarding the analysis and programs are given by Kieser et al. (1987). Parameters used for this survey are listed at the beginning of Appendix Table 2. Fish distributions are plotted as vertical uprights along each transect. The vertical uprights are plotted at one minute intervals using a logarithmic scale of 0.01 to 1.0 kg/m^2.

RESULTS AND DISCUSSION

BIOMASS ESTIMATES AND DISTRIBUTION PLOTS

Table 1 contains a summary of all biomass estimates. Browning Entrance transect grids comprised a total area of 627 km^2. Mean biomass estimates were 4,585 tonnes on the Freeman's grid (Figs. 3-4), 7,560 tonnes on the Whiterocks grid (Fig. 5), 1,170 tonnes on the Bonilla grid (Fig. 6) and 1,920 tonnes on the inshore Browning Entrance grid (Fig. 7). Juan Perez Sound transect grids comprised a total area of 164 km^2. Mean biomass estimate were 32,575 tonnes inside the sound (Figs. 8-13) and 316 tonnes at the entrance (Fig.14). A summary of the biomass data by transect and grid pattern is given in Appendix Table 2.

REPETITIVE HYDROACOUSTIC SURVEYS

During daylight coverage of the Freeman's ground, herring schools appeared as numerous, dense, near-bottom aggregations 60-80 m from the transducer. At dusk they appeared as light skimmers between 40 and 60 metres. Total biomass was estimated at 4,730 t during daylight and 4,440 t at dusk over the same transect grid.

In Juan Perez Sound, repeated coverage at dawn and dusk over 3 successive evenings showed a change in the distribution of herring from a dispersed school configuration throughout the entire sound to a concentration at the head of the sound and into Sedgwick Bay and Darwin Sound (Figs. 8-13). Previous hydroacoustic surveys have shown significant differences in distribution and total biomass between night and day. This survey shows significant distribution changes over three successive evenings and relatively small changes in total biomass. Biomass estimates were 24,100 t (dawn 1), 18,100 t (dusk 1), 27,100 t (dawn 2), 32,000 t (dusk 2), 40,800 t (dusk 3) and 30,400 t (dawn 3). The mean biomass in the area (32,575 ± 5,851 t SD) does not include the first dawn and dusk biomass estimates as technical difficulties with the echo integration system resulted in incomplete coverage. The depth distribution of herring schools at the time of integration was relatively consistent with ninety percent or more of the biomass integrated

between 5 and 40 m from the transducer during the second and third dawn and dusk surveys.

TRAWL FISHING

Midwater trawl fishing was conducted on major acoustic targets located on the Whiterock ground, in Juan Perez Sound and in Sedgwick Bay. A two hour Whiterocks tow yielded an estimated 100 kg of large herring and a few small blackcod. A 40 minute tow in Juan Perez Sound, SW of Ramsay Island yielded approximately 1300 kg of juvenile dogfish and a 20 minute tow at the head of Sedgwick Bay yielded an estimated 6000 kg of large herring and a few adult dogfish. Table 2 documents fishing locations and catches.

TEMPERATURE, SALINITY AND PLANKTON DATA

Five 'Cooperative Plankton Research' (COPRA) CTD/plankton stations were completed using the Guildline system and a 0.25 m^2 bongo equipped with 350 um black Nitex nets. A General Oceanic flowmeter with a low speed rotor was used to measure the volume of seawater filtered. Six additional CTD casts were conducted at 5 nm intervals along a East-West transect extending seaward of Juan Perez Sound. Depth of casts ranged from 65 m to 355 m. Table 3 summarizes the CTD data collected during the survey.

COMPARISON OF HYDROACOUSTIC ESTIMATES WITH OTHER BIOMASS ESTIMATES

The predicted stock biomass from age-structured and escapement models respectively, were 25,600 t and 20,900 t in the Queen Charlotte Islands District (assuming average recruitment) by Haist and Schweigert, 1991. A 50:50 weighting of the models produced a 23,200 t forecast. This compares with a hydroacoustic survey estimate of 32,575 t in Juan Perez Sound.

In the Prince Rupert District, the predicted stock biomass from age-structured and escapement models respectively, were 60,700 t and 19,400 t. For several reasons, the age-structured model estimate was not used in 1990/91 (Haist and Schweigert, 1991). The hydroacoustic survey estimate was 15,235 t in the Browning Entrance area.

CONCLUSIONS

Overwintering Hecate Strait herring were concentrated in the same areas as previous winter surveys in 1984 (Kieser et al. 1987), 1985 (McCarter et al. 1987), 1987 (McCarter et al. 1988) and 1988 (McCarter et al. 1989). Biomass estimates were also in reasonable agreement with previous survey results and those of other stock assessment methods. In the Prince Rupert District it appears that stock size is continuing to decrease since the 1985-86 season, although the decrease could be attributable to incomplete hydroacoustic coverage in the Browning Entrance area. In the Queen Charlotte Island area it appears that stock size is continuing to increase since the 1985-86 season. Other stock assessment methods based on spawn surveys and analyses of catch and age structure (Haist and Schweigert, 1991) support this view. Hydroacoustic surveys using the integration technique have significant potential, however, more effort must be expended to ensure complete and consistent coverage of overwintering herring schools. Depth coverage limitations of the present echo integration system call for a survey design, precisely coordinated to coincide with the diurnal migration patterns of herring at each location and time. This survey provided an opportunity to assess the variability of estimates under such a survey design.

ACKNOWLEDGEMENTS

We thank Captain D. Parfitt and crew of the W. E. RICKER for their generous cooperation and assistance. Students, Melanie Clarke and Keri Ann Snodgrass assisted in monitoring acoustic instruments and recording data.

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Table 1. Summary of herring biomass estimates (t) by locality obtained during W. E. RICKER cruise, December 3-15, 1990.

Locality	Event Number	Transect Name	Survey Area (km^2)	Estimated Biomass (t)	Time (PST)	Date (D/M/Y)
Freeman's ground	3-22	F1-F8	165.7	4,440	14:11-22:13	05.12.90
Browning Entr. (inshore)	25-43	E6-E1	169.3	1,920	01:41-08:04	08.12.90
Freeman's ground	43-69	F1-F6	164.8	4,730	08:04-15:20	08.12.90
Whiterocks ground	70-87	W1-W8	138.8	7,560	15:43-21:44	08.12.90
Bonilla ground	89-114	B1-B9	153.2	1,170	22:04-04:45	08.12.90 09.12.90
Juan Perez Snd. (dawn 1)	116-143	J14-J1	72.6	24,100[a]	00:59-07:31	10.12.90
Juan Perez Snd. (dusk 1)	145-166	J1-J14	87.7	18,100[b]	14:09-19:59	10.12.90
Juan Perez Snd. (dawn 2)	170-190	J1-J14	89.0	27,100	02:45-09:00	11.12.90
Juan Perez Snd. (dusk 2)	192-212	J1-J14	89.0	32,000	13:58-20:16	11.12.90
Perez Entrance	214-234	P9-P1	74.5	316	02:06-07:52	12.12.90
Juan Perez Snd. (dusk 3)	236-257	J14-J1	89.4	40,800	13:42-19:32	12.12.90
Juan Perez Snd. (dawn 3)	262-285	J1-J14	89.2	30,400	01:46-07:54	13.12.90

[a]minimum estimate due to several integration failures.

[b]minimum estimate due to incorrectly set depth stata.

Table 2. Midwater trawling locations and species compositions of catches made by the W. E. RICKER, December 3-15, 1990.

Tow number	1	2	3
Date (Day/Mo.)	09/12	11/12	13/12
Time (P.S.T.)	09:55	10:35	13:15
Duration (min)	125	40	20
Location	Whiterocks	Juan Perez Snd.	Sedgwick Bay
Start			
Latitude (o ')	53 43.1	52 32.8	52 39.1
Longitude (o ')	130 46.6	131 29.3	131 33.8
Finish			
Latitude (o ')	53 44.8	52 31.4	52 37.2
Longitude (o ')	130 50.3	131 26.5	131 32.5
Bottom depth (m)			
Start	115	200	100
Finish	109	-	150
Net depth (m)			
Start	95	100	110
Finish	100	120	120
Speed (kts)	3-4	3-4	3-4
Warp length (m)	250	300	300
Spiny dogfish (adult)	-	-	50
Spiny dogfish (juven)	-	1300	-
Pacific herring	100	-	6000
Sablefish	3	-	-
Total catch (kg)	103	1300	6050

Table 3. Summary of CTD data collected during W. E. RICKER cruise, December 3-15, 1990.

Station Name	Latitude (deg min)	Longitude (deg min)	Date (Y/M/D)	Time	Max Depth (m)	Surface Salin (o/oo)	Surface Temp (° C)	CTD Cast Number
F1	49 20.3	124 05.0	901203	1048	355	28.2	8.8	1
E1	51 0.2	127 50.5	901204	0919	97	31.3	9.1	2
H2	53 25.0	130 45.0	901209	1459	134	31.7	8.2	3
H1	52 30.0	130 40.0	901209	2135	65	32.1	9.0	4
ST0	52 32.2	131 28.8	901211	2117	196	31.3	7.6	5
ST1	52 32.0	131 20.7	901212	1304	256	31.9	7.9	6
ST2	52 31.5	131 12.1	901212	0835	124	32.3	8.1	7
ST3	52 31.2	131 03.7	901212	0921	165	32.0	8.2	8
ST4	52 30.9	130 55.8	901212	1004	65	32.1	8.2	9
ST5	52 30.3	130 48.1	901212	1051	85	32.2	8.3	10
F2	49 29.0	124 31.5	901215	1029	272	27.3	7.9	11

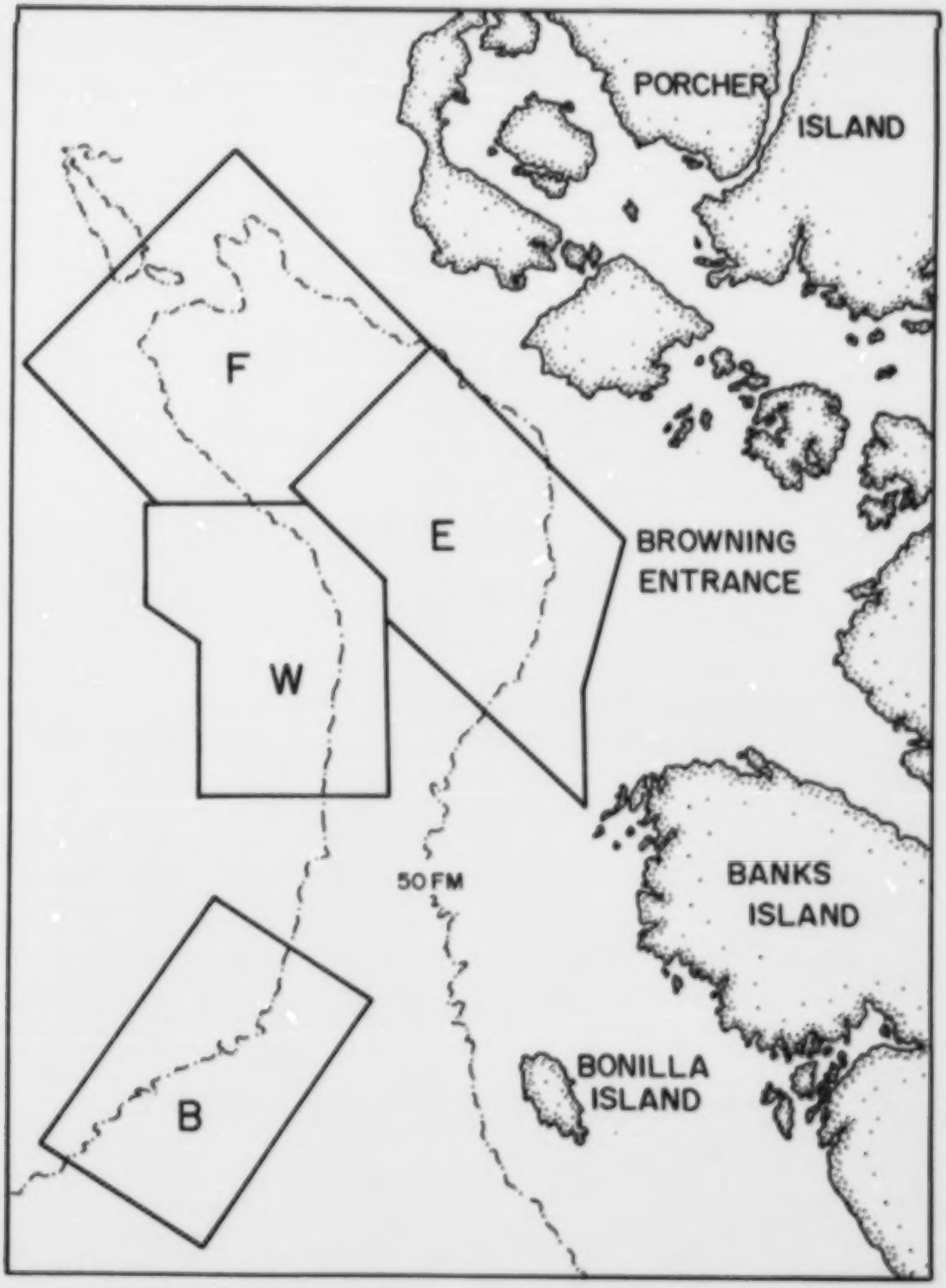

Fig. 1. Location of transect grids in Browning Entrance during W. E. RICKER cruise 90HER2, December 3-15, 1990 (F - Freeman's ground, W - Whiterocks ground, B - Bonilla ground, E - Browning Entrance, inshore).

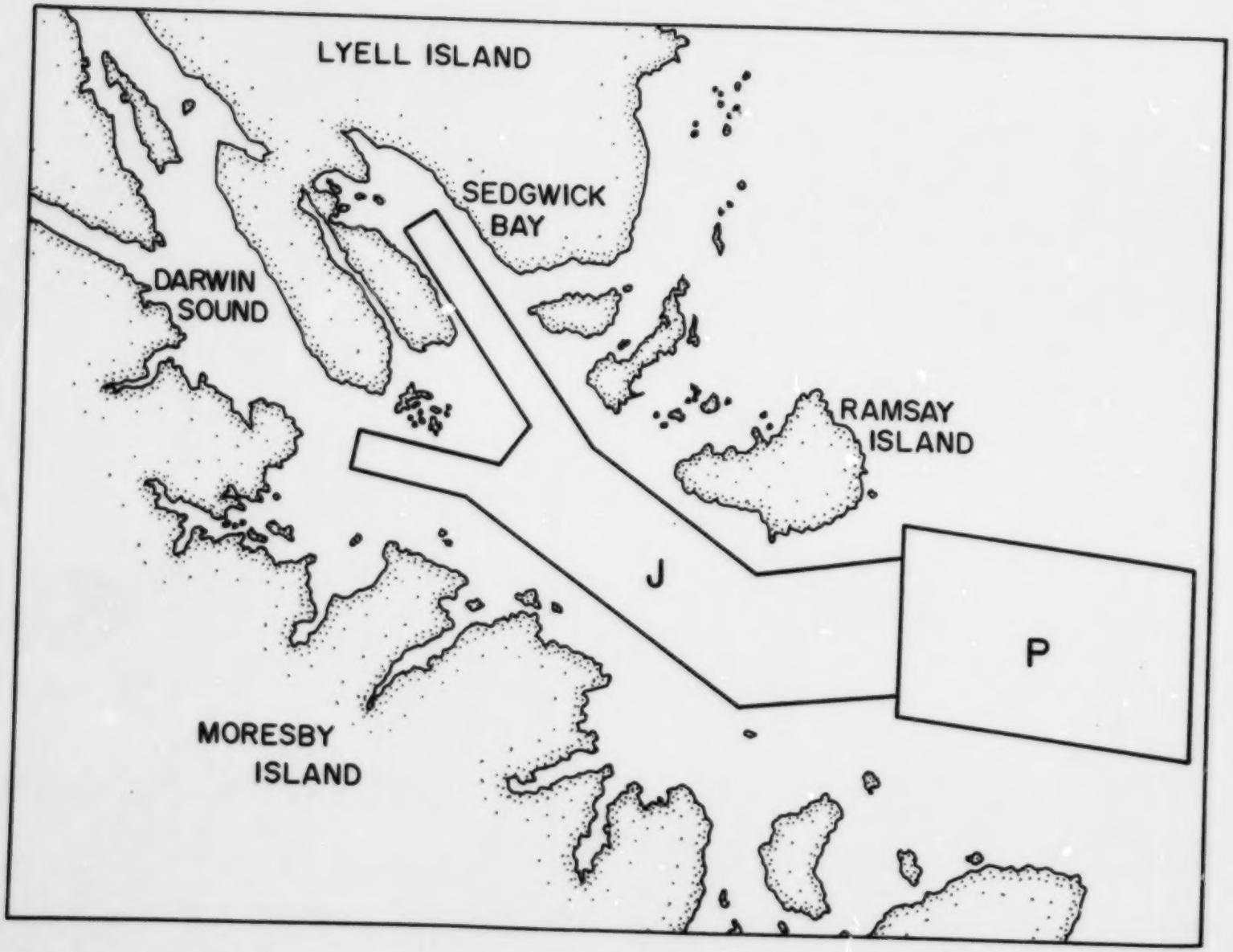

Fig. 2. Location of transect grids in Juan Perez Sound during W. E. RICKER cruise 90HER2, December 3-15, 1990 (J - Juan Perez grid, P - Juan Perez entrance grid).

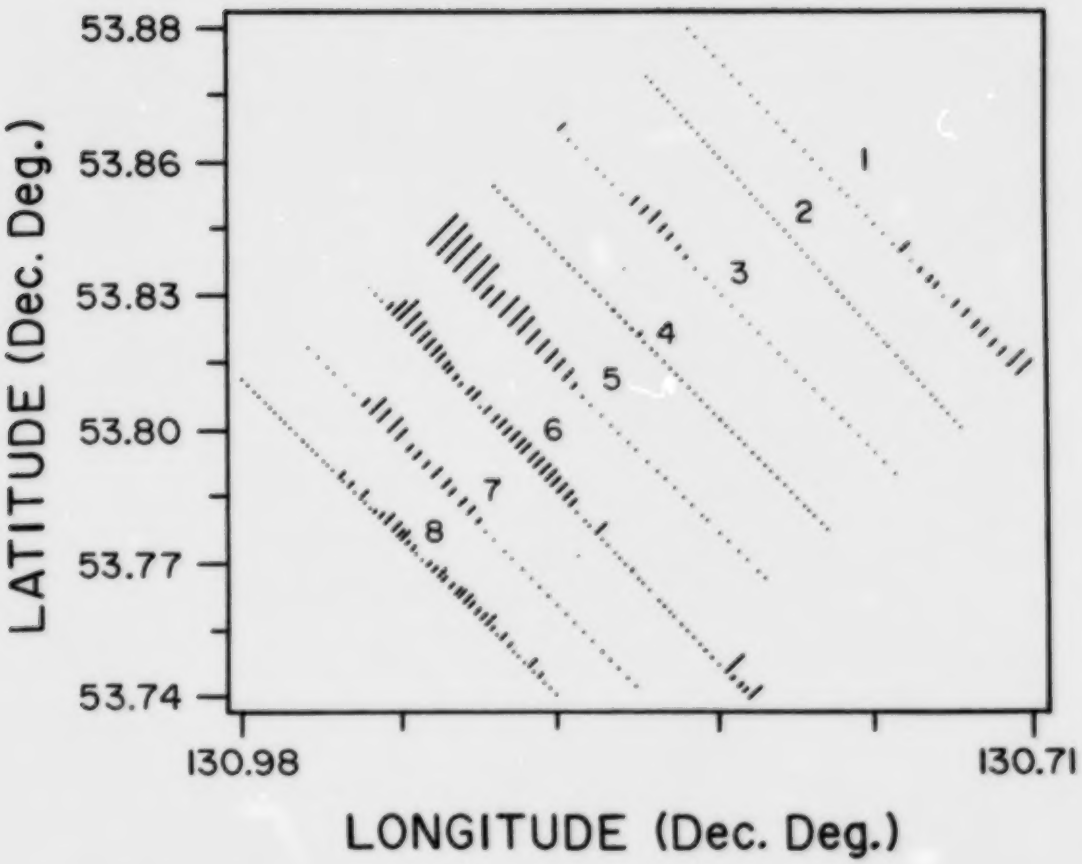

Fig. 3. Biomass density map of the Freeman's ground (dusk). Total biomass estimated at 4,440 t. Density bars along transects are marked at one minute intervals and use a logarithmic scale of 0.01 to 1.0 kg/m^2.

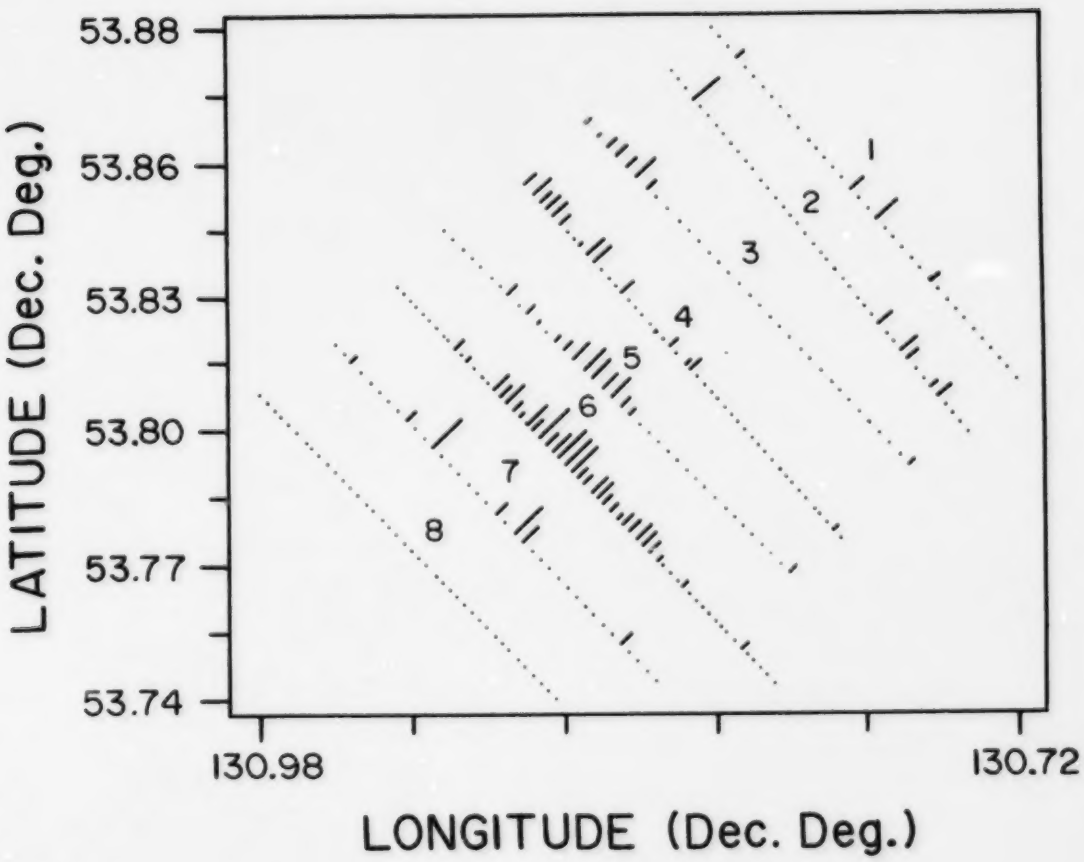

Fig. 4. Biomass density map of the Freeman's ground (day). Total biomass estimated at 4,730 t. Density bars are marked at one minute intervals and use a logarithmic scale of 0.01 to 1.0 kg/m^2.

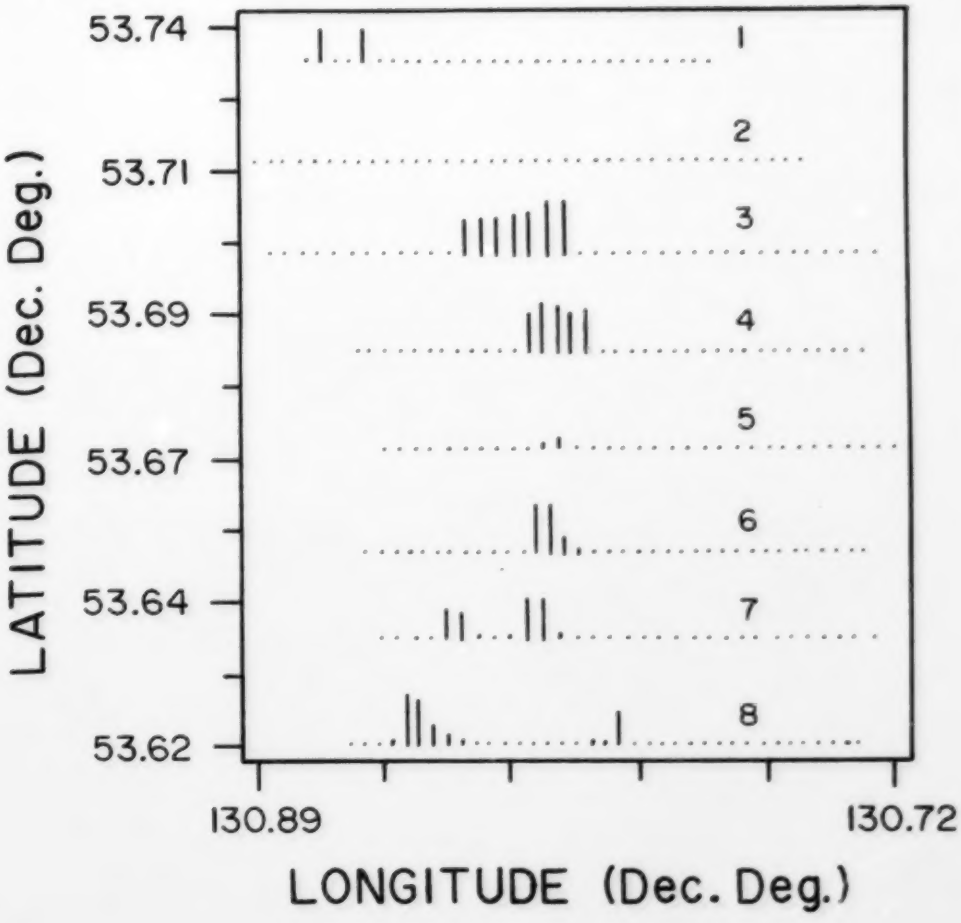

Fig. 5. Biomass density map of the Whiterocks ground (dusk). Total biomass estimated at 7,560 t. Density bars along transects are marked at one minute intervals and use a logarithmic scale of 0.01 to 1.0 kg/m^2.

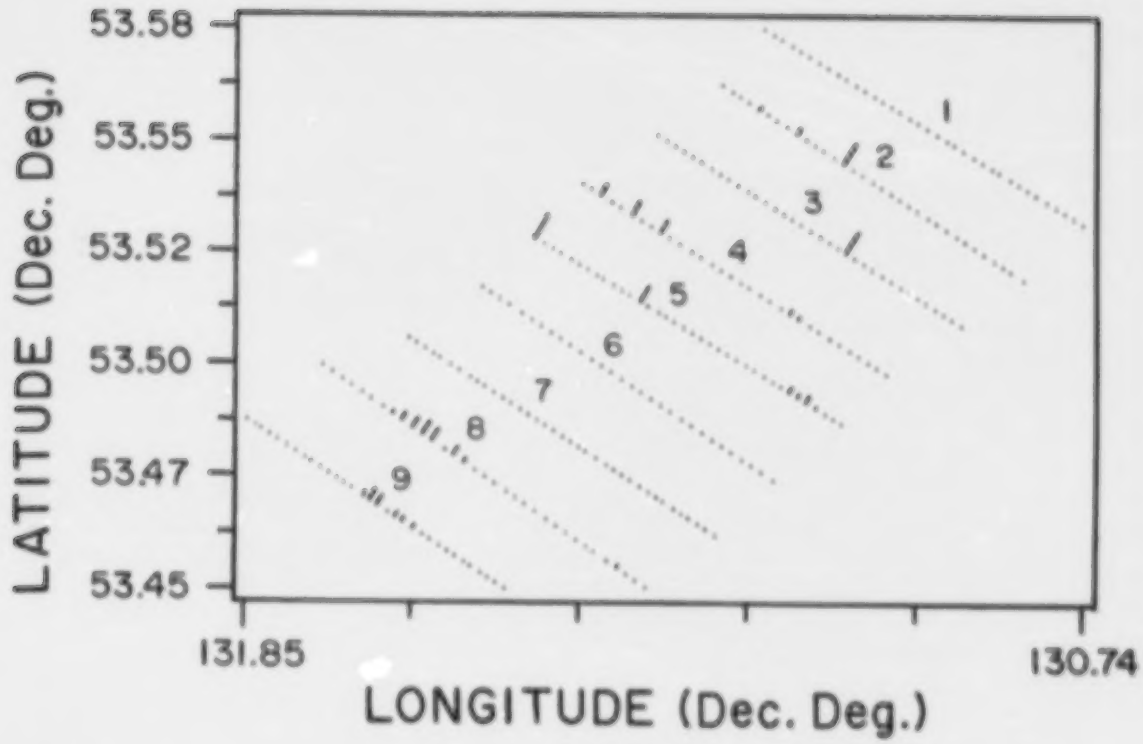

Fig. 6. Biomass density map of the Bonilla ground (dawn). Total biomass estimated at 1,170 t. Density bars along transects are marked at one minute intervals and use a logarithmic scale of 0.01 to 1.0 kg/m^2.

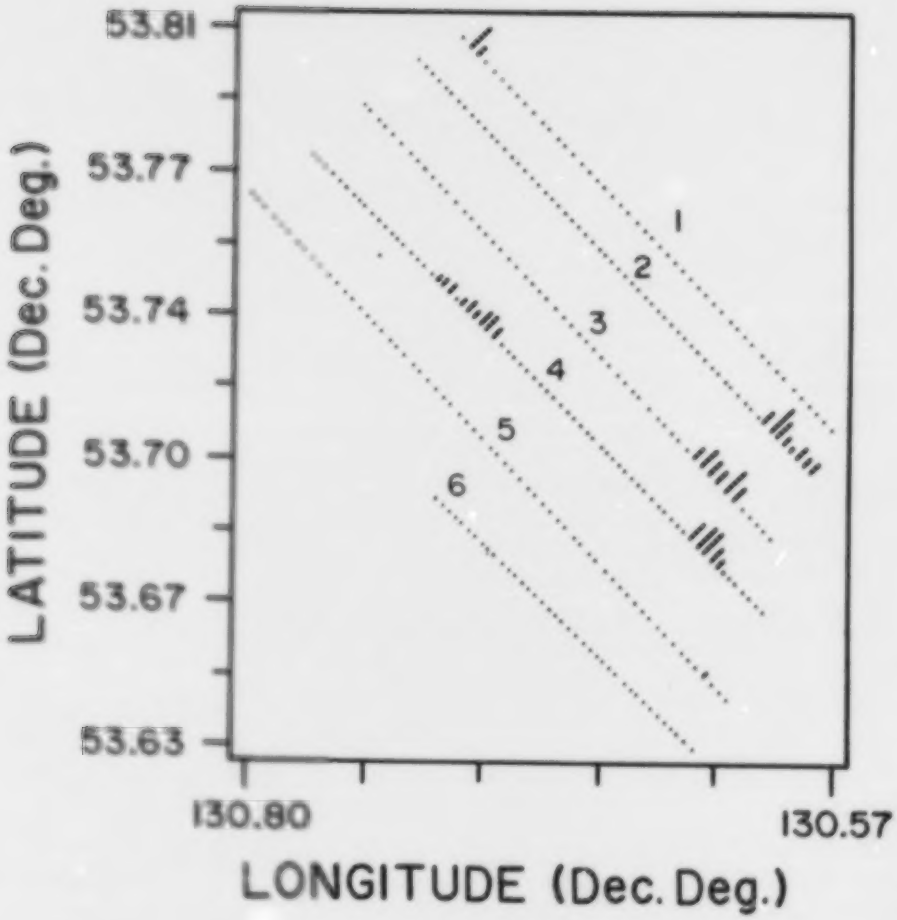

Fig. 7. Biomass density map of the Browning Entrance inshore ground (dawn). Total biomass estimated at 1,920 t. Density bars along transects are marked at one minute intervals and use a logarithmic scale of 0.01 to 1.0 kg/m^2.

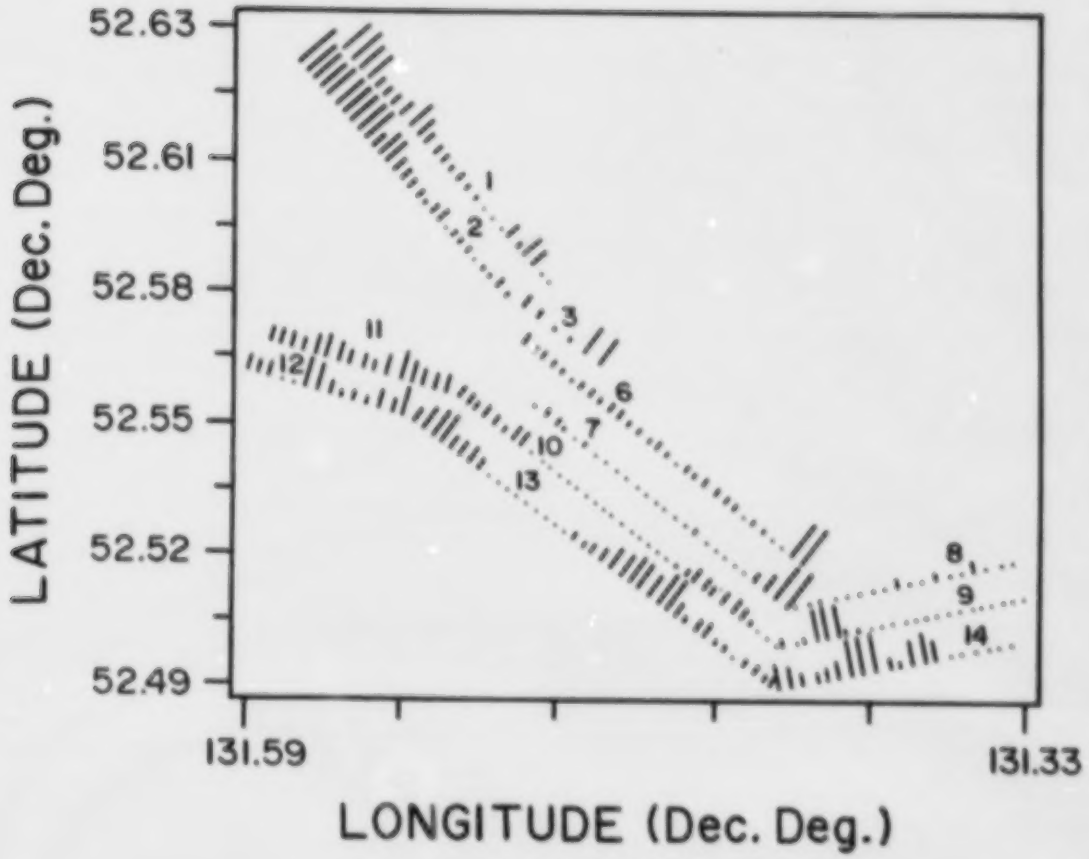

Fig. 8. Biomass density map of Juan Perez Sound (dawn 1). Total biomass estimated at 24,100 t. Density bars along transects are marked at one minute intervals and use a logarithmic scale of 0.01 to 1.0 kg/m^2. This is a minimum estimate due to several integration failures.

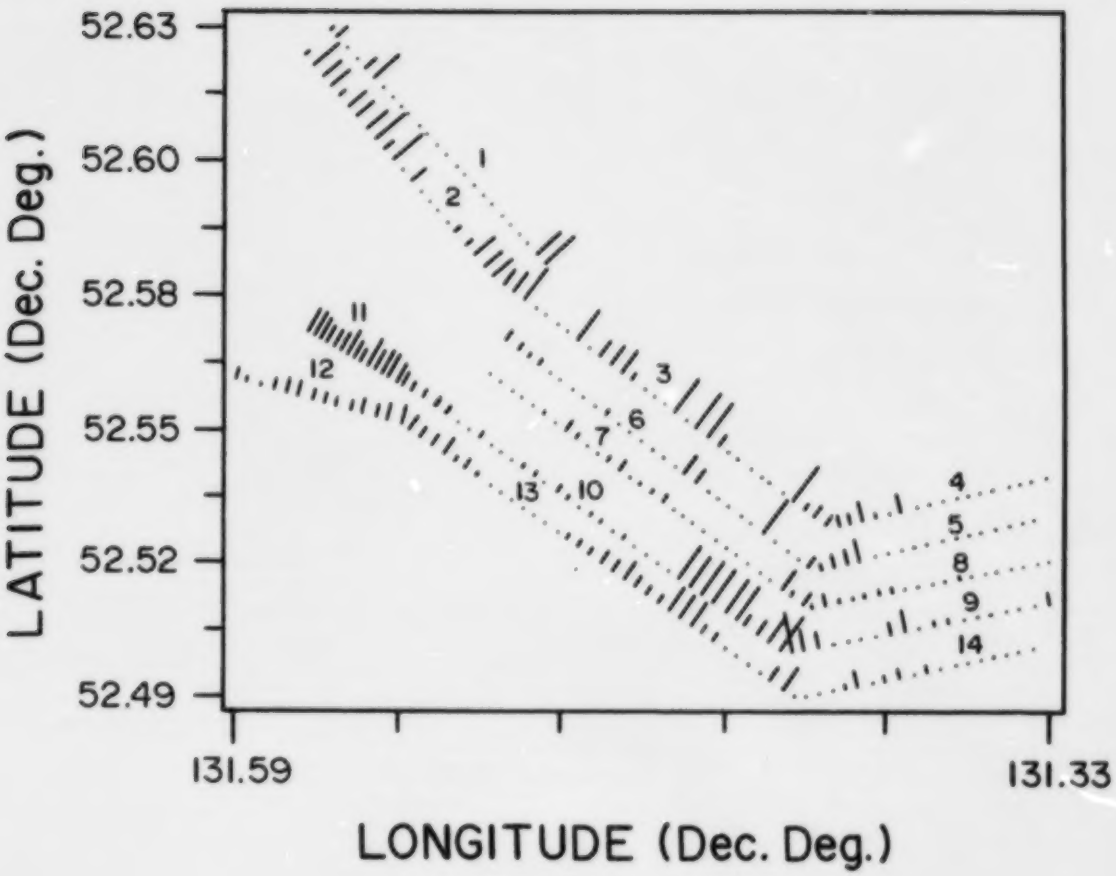

Fig. 9. Biomass density map of Juan Perez Sound (dusk 1). Total biomass estimated at 18,100 t. Density bars along transects are marked at one minute intervals and use a logarithmic scale of 0.01 to 1.0 kg/m^2. This is a minimum estimate due to incorrectly set integration ranges.

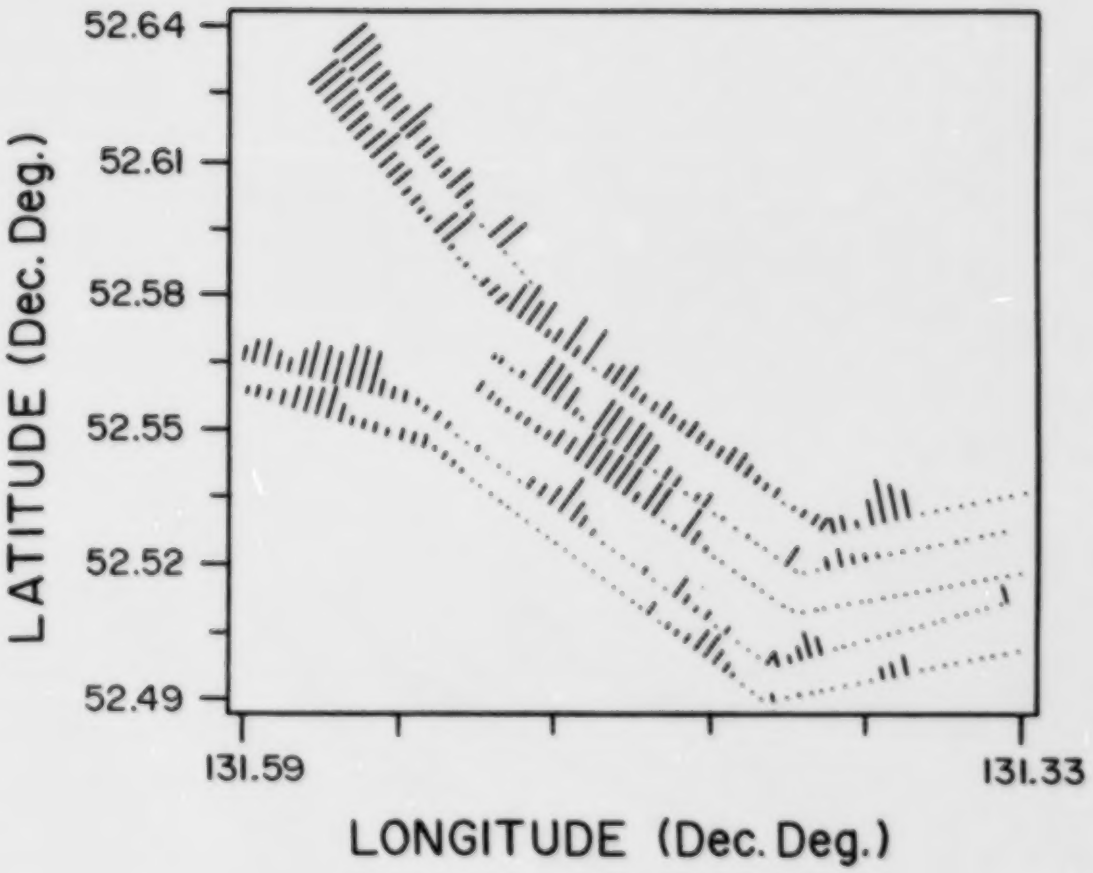

Fig. 10. Biomass density map of Juan Perez Sound (dawn 2). Total biomass estimated at 27,100 t. Density bars along transects are marked at one minute intervals and use a logarithmic scale of 0.01 to 1.0 kg/m^2.

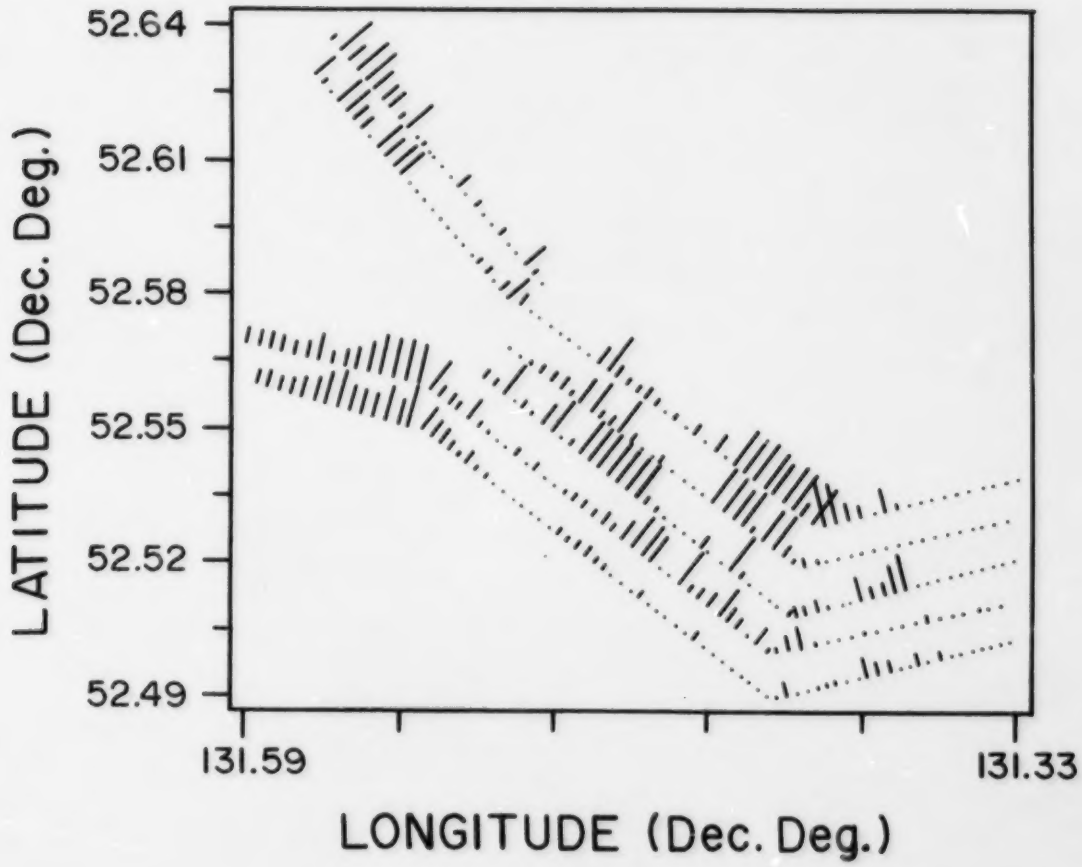

Fig. 11. Biomass density map of Juan Perez Sound (dusk 2). Total biomass estimated at 32,000 t. Density bars along transects are marked at one minute intervals and use a logarithmic scale of 0.01 to 1.0 kg/m^2.

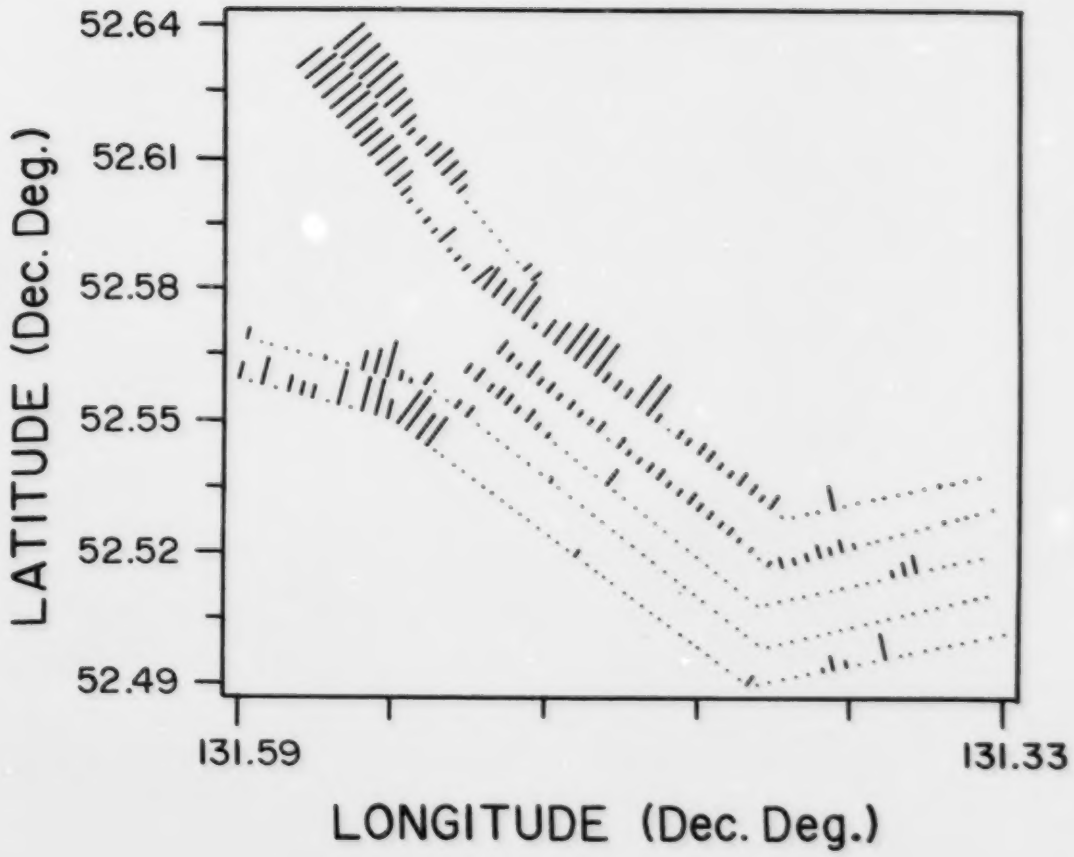

Fig. 12. Biomass density map of Juan Perez Sound (dusk 3). Total biomass estimated at 40,800 t. Density bars along transects are marked at one minute intervals and use a logarithmic scale of 0.01 to 1.0 kg/m^2.

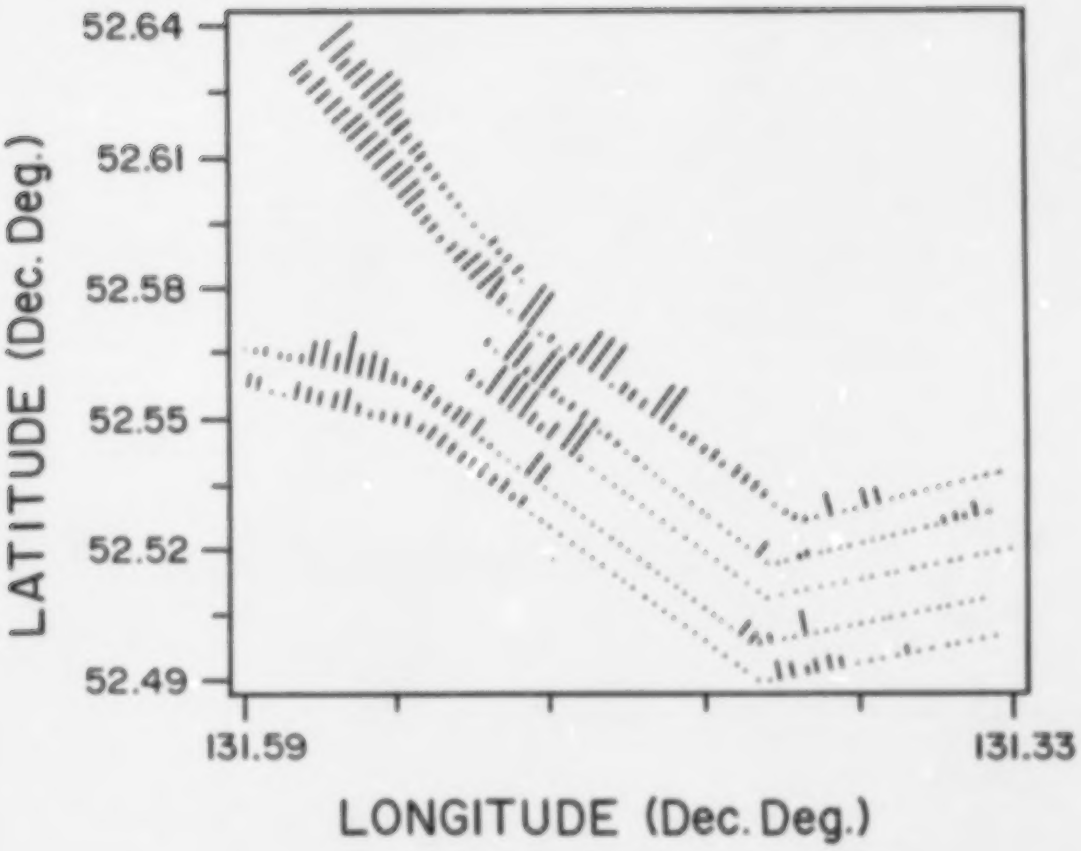

Fig. 13. Biomass density map of Juan Perez Sound (dawn 3). Total biomass estimated at 30,400 t. Density bars along transects are marked at one minute intervals and use a logarithmic scale of 0.01 to 1.0 kg/m^2.

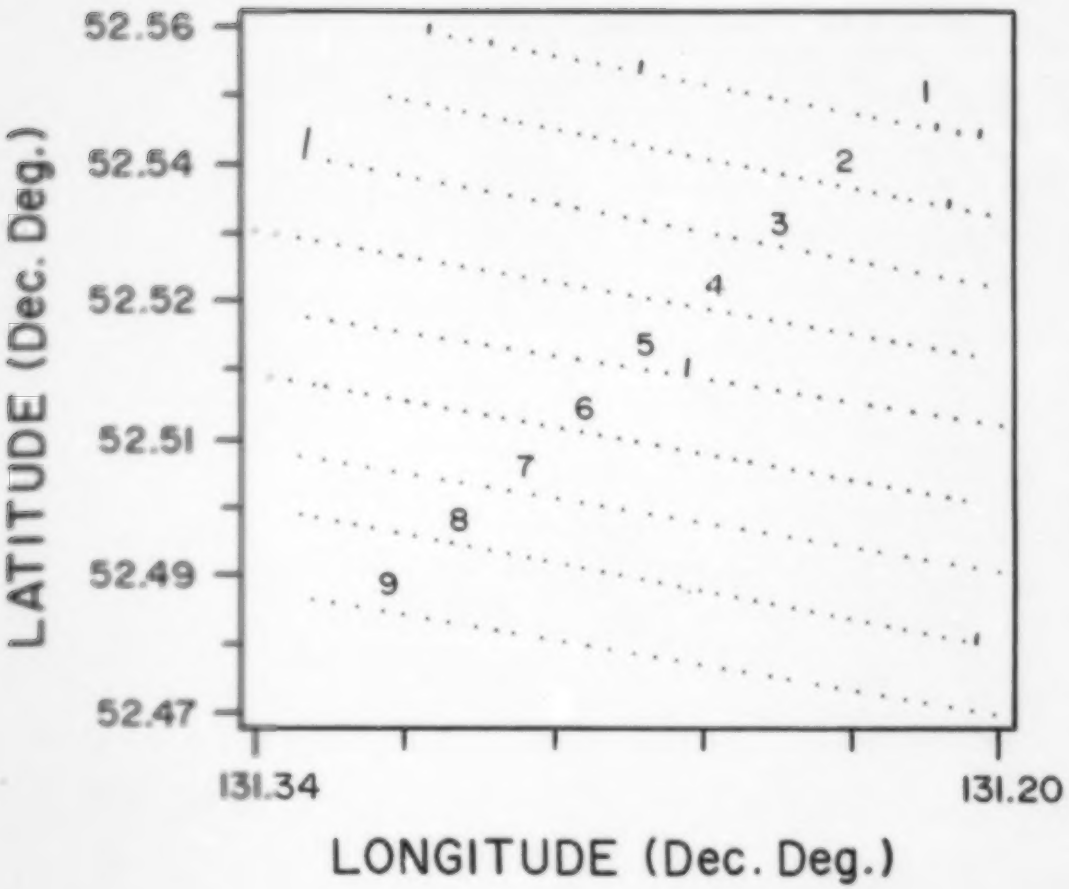

Fig. 14. Biomass density map of Juan Perez - entrance (dawn). Total biomass estimated at 316 t. Density bars along transects are marked at one minute intervals and use a logarithmic scale of 0.01 to 1.0 kg/m^2.

Appendix Table 1. Cruise schedule of the W. E. RICKER, December 3-15, 1990.

Date	Time	Activity
29 Nov	08:00	Load D-5 midwater trawl net and sweeplines
03 Dec	08:00	Scientific party, B. McCarter, P. Withler, M. Clarke and K. Snodgrass board W. E. RICKER at PBS, Nanaimo
	10:30	W. E. RICKER depart Departure Bay, Nanaimo
	10:48	CTD/BONGO at COPRA STATION F1 (Ballenas Is.)
		CTD/BONGO at COPRA STATION F2 aborted due to bad weather
04	09:19	CTD at COPRA STATION E1 (Pine Is.)
	15:00	Deploy towed body transducer, test and calibrate
05	13:11	Commence transects F1-F8 (Freeman's ground)
06	00:00	Jog in Principie Channel due to bad weather
07	13:00	SAR call for vessel NORSAL
08	01:41	Commence transects E6-E1 (Browning Entrance - inshore)
	08:04	Commence transects F1-F8 (Freeman's ground)
	15:43	Commence transects W1-W8 (Whiterocks ground)
	22:04	Commence transects B1-B9 (Bonilla ground)
09	06:00	Commence fishing on Bonilla ground
	09:00	Commence fishing on Whiterock ground
	09:55	Commence trawl tow #1 on Whiterock ground
	14:59	CTD/BONGO at COPRA STATION H2 (Bonilla Is.)
	21:35	CTD/BONGO at COPRA STATION H1 (Ramsay Is.)
10	01:00	Commence transects J14-J1 (Juan Perez Sound - dawn 1)
	14:09	Commence transects J1-J14 (Juan Perez Sound - dusk 1)
11	02:45	Commence transects J1-J14 (Juan Perez Sound - dawn 2)
	08:00	Commence fishing in Juan Perez Sound
	10:35	Commence trawl tow #2 in Juan Perez Sound
	13:58	Commence transects J1-J14 (Juan Perez Sound - dusk 2)
	21:17	CTD at station ST0 in Juan Perez Sound
12	02:06	Commence transects P9-P1 (Juan Perez - entrance)
	08:35	CTD at station ST2 east of Juan Perez Sound
	09:21	CTD at station ST3 east of Juan Perez Sound
	10:04	CTD at station ST4 east of Juan Perez Sound
	10:51	CTD at station ST5 east of Juan Perez Sound
	13:04	CTD at station ST1 east of Juan Perez Sound
	13:42	Commence transects J14-J1 (Juan Perez Sound - dusk 3)
13	01:46	Commence transects J1-J14 (Juan Perez Sound - dawn 3)
	13:15	Commence trawl tow #3 in Sedgwick Bay
	23:00	Depart Juan Perez Sound
15	10:29	CTD/BONGO at COPRA STATION F2 (Sisters Is.)
	14:00	W. E. RICKER return Departure Bay, Nanaimo
17	08:00	Offload fishing gear and samples

Appendix Table 2. Edited biomass output of W. E. RICKER cruise, December 3-15, 1990. A biomass estimate in tonnes is given for each transect under the far right column headed 'BIOMASS' and a cumulative biomass follows on the line below which is underlined at completion. Parameters are described as follows:

Current parameters	Description
ICO 0BIO.CON	Input control file (file name, TT: or N)
IDA HHERR01.D89	Input echo integration file (file name or N)
OFB 0BIO.YFB	Output full biomass (file name, TT: or N)
FBO CUM	For full biomass output: SEQ, CUM, BOTH
CEV 0,99999	Choose first and last event
DEB 0	Debugging output: 0, 1, 2
ECH Y	Echo control lines: Y or N
TLL 218.5	Transmit level (dB) re 1 uPascal at 1m
RSS -134.77	Receiver sensitivity (dB) re 1 Volt/uPascal
BFF -17.55	Beam factor (dB)
REF 1.0	Reference range for receiver TVG (m)
ALP .0099	Absorption coefficient for receiver TVG (dB/m)
SOU 1490.0	Speed of sound in water (m/sec)
TAU 0.6	Pulse length (m/sec)
GAI -1.4 -12.0	Bandpass + shell gain (dB) Receiver gain (dB)
TVC 0,0	Near range and TVG correction factor (dB)
TVG 20,0.0099 20,0.0099	Time varied gain = 20 log R + 2*ALP*R
TSS -32.0	Target strength (dB/Kg)
MME 0,100	Min. & max. accepted integration value (V^2)
DEP 5,200	Min. & max. depth strata or window (m)
UNI NM	Units for DPP and WID: km or nm
DPP 0.001	Distance per ping (UNI/ping)
WID 1.0	Width of transects (nm)
AVE 1	Number of Sequences to be averaged
EVE 3 14:11 53 48.7 130 42.8	Event number, Time, Position (Lat./Long.)
DAT 05-DEC-90	Date DD-MMM-YY
TRA F1 23 60 2280 6.0 318 0.6 9	T-name Seq1 Seq2 Pit Dis Bea TimeD Speed
LOU	Zero 1. cumulative biomass output
ZER	Zero 1. and 2. cumulative biomass output
EXI	Close files, exit

Other symbols and units of measurement:

T-name	Transect name	Len	Length of transect (km)
Seq1	First sequence number	Area	Area of transect coverage (km^2)
Seq2	Last sequence number	Rang	Average total range (m)
Pit	Total number of pings	Col	Av. integrated range of column (m)
Dis	Total distance (nm)	Dcs	Av. dist. of biomass to surface (m)
Bea	Compass bearing	Dcb	Av. dist. of biomass to bottom (m)
TimeD	Time (hrs) to complete	Lcb	Av. dist. of biomass from Seq1 (km)
Speed	Av. ship's speed (kn)	Vol D	Volume density (kg/m^3)
		Surf D	Surface or area density (kg/m^2)
		Biomass	Biomass of target (tonnes)

Appendix Table 2 (Cont'd.)

Transmit level (TLL 218.50 dB) and receiver sensitivity (RSS -134.77 dB) were determined during an August, 1990 SYSTEM CALIBRATION at the hydroacoustic barge of the University of Washington, Seattle. Biosonics model 101 (1985) echo sounder, Biosonics model 121 (1979) echo integrator and Simrad transducer #4318 (1980) with 300 m cable.

```
*
*EVE 1  13:57  53 48.74  130 41.15 ! Start-up integrator, Tape # 1
*DAT 05-DEC-90
*UNI NM
*IDA HHERR01.D89
*WID 1.0
*DEP 5,200
*EVE 2  14:07  53 48.27  130 42.34 ! Sequence synchronization
*
*EVE 3  14:11  53 48.65  130 42.82 ! FREEMAN GRID -  DUSK COVERAGE 1
*! ------------------------------------------------------------------
*! Tra T-name  Seq1   Seq2    Pit     Dis     Bea   TimeD   Speed
*!               #      #      #      nm       o     hrs      kn
*! ------------------------------------------------------------------
*TRA   F1       23     60   2280   6.002 318.138   0.617   9.733
*ZER
> Overall gain GaiOd! dB:    49.283   8.478E+04
>              with TSS:    17.283   5.349E+01

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 #     #    km  km^2     m     m     m     m    km  kg/m^3   kg/m^2        t
 38  2280  11.1  20.6  54.9  49.9  32.6  38.6   1.8 2.46E-04 1.23E-02 2.52E+02
 38  2280  11.1  20.6  54.9  49.9  32.6  38.6   0.0 2.46E-04 1.23E-02 2.52E+02
*
*EVE 4  14:23  53 50.05  130 44.82 ! RX gain from -6 to -12
*
*EVE 5  14:28  53 50.81  130 45.99 ! Turn off skipper sounder
*
*EVE 6  14:48  53 53.12  130 49.61 !
*TRA END
*
*EVE 7  15:03  53 52.49  130 50.43 !
*TRA   F2       75    129   3300   5.875 139.993   0.733   8.011

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 55  3300  10.9  20.2  78.6  73.6  37.2  42.4   5.5 2.32E-05 1.70E-03 3.43E+01
 93  5580  22.0  40.7  66.6  61.6  33.2  39.0   0.0 1.14E-04 7.03E-03 2.87E+02
*
*EVE 8  15:29  53 50.31  130 47.29 ! Waypoint
*
*EVE 9  15:47  53 47.99  130 44.03 !
*TRA END
```

```
*EVE 10  16:09  53 47.39  130 45.30 !
*TRA   F3      141    178   2280   6.009 317.638   0.617   9.744

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 38  2280  11.1  20.6  88.6  83.6  69.2  15.6   7.1 9.10E-05 7.61E-03 1.57E+02
131  7860  33.1  61.3  74.0  69.0  45.9  30.7   0.0 1.05E-04 7.23E-03 4.43E+02
*
*EVE 11  16:46  53 51.83  130 52.16 ! Switching from GPS to loran
*TRA END
*
*EVE 12  17:02  53 51.09  130 53.51 !
*TRA   F4      194    247   3240   5.987 137.585   0.883   6.778

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 54  3240  11.1  20.5  86.1  81.1  63.4  19.9   4.4 6.26E-05 5.08E-03 1.04E+02
185 11100  44.2  81.9  77.0  72.0  49.2  28.7   0.0 9.29E-05 6.69E-03 5.48E+02
*
*EVE 13  17:55  53 46.67  130 46.67 !
*TRA END
*
*EVE 14  18:10  53 46.06  130 47.85 !
*TRA   F5      262    299   2280   5.987 316.327   0.600   9.978

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 38  2280  11.1  20.5  95.4  90.4  59.6  17.9   9.8 1.45E-03 1.31E-01 2.70E+03
223 13380  55.3 102.4  80.7  75.7  57.9  19.7   0.0 4.18E-04 3.17E-02 3.24E+03
*
*EVE 15  18:46  53 50.39  130 54.85 !
*TRA END
*
*EVE 16  19:01  53 49.83  130 56.00 ! Porpoise noise
*TRA   F6      315    377   3780   6.988 139.324   1.067   6.552

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 63  3780  12.9  24.0  89.0  84.0  68.9  16.5   5.1 3.21E-04 2.70E-02 6.47E+02
286 17160  68.2 126.4  82.3  77.3  59.7  19.2   0.0 3.98E-04 3.08E-02 3.89E+03
*
*EVE 17  19:48  53 46.11  130 50.26 ! Tape # 2
*
*EVE 18  20:05  53 44.53  130 48.29 !
*TRA END
*
*EVE 19  20:20  53 44.65  130 50.51 !
*TRA   F7      393    430   2280   5.938 318.104   0.650   9.135

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 38  2280  11.0  20.4  83.8  78.8  58.8  22.3   6.9 2.05E-04 1.62E-02 3.29E+02
324 19440  79.2 146.8  82.5  77.5  59.6  19.4   0.0 3.71E-04 2.87E-02 4.22E+03
*
*EVE 20  20:59  53 49.07  130 57.22 !
*TRA END
```

```
*EVE 21  21:13  53 48.63  130 58.56 ! Porpoise noise
*TRA   F8      446    505   3600   5.521 136.429   1.000   5.521

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 60  3600  10.2  18.9  56.8  51.8  40.9  19.7   5.9 2.30E-04 1.19E-02 2.25E+02
384 23040  89.5 165.7  79.5  74.5  58.7  19.4   0.0 3.60E-04 2.68E-02 4.44E+03
*
*EVE 22  22:13  53 44.63  130 52.12 ! Quit sounding, weather worsens
*TRA END
*
*EVE 23  01:15  53 43.16  130 45.56 ! Start-up integrator
*DAT 08-DEC-90
*IDA HHERR02.D89
*
*EVE 24  01:23  53 43.54  130 46.32 ! Sequence Synchronization
*
*EVE 25  01:41  53 41.72  130 43.84 ! BROWNING ENTRANCE GRID - DAWN COVERAGE 1
*! ------------------------------------------------------------
*! Tra T-name  Seq1   Seq2    Pit     Dis     Bea   TimeD   Speed
*!               #      #      #      nm       o     hrs      kn
*! ------------------------------------------------------------
*TRA   E6       28     66   2340   5.223 135.576   0.650   8.035
*ZER

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 #     #    km  km^2     m     m     m     m    km   kg/m^3   kg/m^2        t
 39  2340   9.7  17.9  88.8  83.8  47.3  48.6   4.2 9.77E-06 8.19E-04 1.47E+01
 39  2340   9.7  17.9  88.8  83.8  47.3  48.6   0.0 9.77E-06 8.19E-04 1.47E+01
*
*EVE 26  02:20  53 37.99  130 37.67 !
*TRA END
*
*EVE 27  02:26  53 38.71  130 36.82 !
*TRA   E5       72    134   3780  10.061 318.284   1.033   9.736

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 63  3780  18.6  34.5  99.5  94.5  50.7  32.3   7.7 1.67E-05 1.58E-03 5.45E+01
102  6120  28.3  52.4  95.8  90.8  49.9  35.8   0.0 1.45E-05 1.32E-03 6.92E+01
*
*EVE 28  02:58  53 42.47  130 42.48 ! Waypoint
*
*EVE 29  03:28  53 46.22  130 48.13 !
*TRA END
*
*EVE 30  03:41  53 46.78  130 46.72 !
*TRA   E4      147    216   4200   9.262 136.781   1.167   7.939

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 70  4200  17.2  31.8 100.2  95.2  78.0   8.7  11.4 1.79E-04 1.71E-02 5.42E+02
172 10320  45.5  84.2  97.5  92.5  74.8  11.7   0.0 7.85E-05 7.26E-03 6.11E+02
```

```
*EVE 31  04:18  53 43.30  130 31.16 ! Waypoint
*
*EVE 32  04:45  53 40.51  130 37.13 ! Tape # 3
*
*EVE 33  04:51  53 40.03  130 36.00 !
*TRA END
*
*EVE 34  04:59  53 41.04  130 35.80 !
*TRA   E3      225    278   3240   8.709 318.478   0.883   9.859

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 54  3240  16.1  29.9  91.0  86.0  47.0   8.3   2.8 1.96E-04 1.69E-02 5.04E+02
226 13560  61.6 114.1  95.8  90.8  62.3  10.2   0.0 1.08E-04 9.77E-03 1.11E+03
*
*EVE 35  05:33  53 45.15  130 41.99 ! Waypoint
*
*EVE 36  05:52  53 47.56  130 45.56 !
*TRA END
*
*EVE 37  06:05  53 48.21  130 44.27 !
*TRA   E2      292    351   3600   8.262 137.999   1.017   8.127

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 60  3600  15.3  28.3  85.5  80.5  40.6   8.2  13.2 2.02E-04 1.63E-02 4.61E+02
286 17160  76.9 142.4  93.7  88.7  55.9   9.6   0.0 1.25E-04 1.11E-02 1.58E+03
*
*EVE 38  06:39  53 44.91  130 39.22 ! Waypoint
*
*EVE 39  07:06  53 42.07  130 34.92 !
*TRA END
*
*EVE 40  07:15  53 42.70  130 34.39 ! Keeping Seaward of transect
*TRA   E1      362    409   2880   7.835 317.756   0.817   9.594

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 48  2880  14.5  26.9  73.7  68.7  64.9   9.1  13.3 1.85E-04 1.27E-02 3.42E+02
334 20040  91.4 169.3  90.6  85.6  57.5   9.5   0.0 1.32E-04 1.13E-02 1.92E+03
*
*EVE 41  07:43  53 45.85  130 39.41 ! Waypoint
*
*EVE 42  07:56  53 47.56  130 41.80 ! Waypoint
```

```
*EVE 43  08:04  53 48.50  130 43.30 ! FREEMAN GRID - DAYTIME COVERAGE 1
*! ------------------------------------------------------------
*! Tra T-name  Seq1   Seq2    Pit     Dis      Bea   TimeD   Speed
*!               #      #      #      nm        o     hrs      kn
*! ------------------------------------------------------------
*TRA   F1      410    445   2160   5.914 321.063   0.600   9.856
*ZER

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 #     #    km  km^2     m     m     m     m    km   kg/m^3   kg/m^2        t
 36  2160  11.0  20.3  46.5  41.5  35.1   6.2   5.4 2.42E-04 1.00E-02 2.04E+02
 36  2160  11.0  20.3  46.5  41.5  35.1   6.2   0.0 2.42E-04 1.00E-02 2.04E+02
*
*EVE 44  08:26  53 51.05  130 47.63 ! Waypoint
*
*EVE 45  08:40  53 53.10  130 49.60 ! Position Corrected
*TRA END
*
*EVE 46  09:09  53 52.55  130 50.34 ! Restart integrator
*IDA HHERR03.D89
*TRA   F2       19     59   2460   5.908 143.181   0.800   7.385

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 41  2460  10.9  20.3  56.3  51.3  49.0   7.4   5.1 3.31E-04 1.70E-02 3.44E+02
 77  4620  21.9  40.5  51.4  46.4  43.8   6.9   0.0 2.91E-04 1.35E-02 5.47E+02
*
*EVE 47  09:36  53 49.82  130 46.60 ! Waypoint
*
*EVE 48  09:57  53 47.82  130 44.34 ! Sound paper ran out
*TRA END
*
*EVE 49  10:02  53 47.38  130 45.47 !
*TRA   F3       65     97   1980   5.975 319.010   0.600   9.959

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 33  1980  11.1  20.5  85.0  80.0  54.1  27.0   8.7 1.45E-04 1.16E-02 2.38E+02
110  6600  33.0  61.0  62.6  57.6  47.0  13.0   0.0 2.23E-04 1.29E-02 7.85E+02
*
*EVE 50  10:07  53 47.89  130 46.87 ! Waypoint
*
*EVE 51  10:21  53 49.66  130 48.99 ! Waypoint
*
*EVE 52  10:38  53 51.89  130 52.11 !
*TRA END
*
*EVE 53  10:52  53 51.95  130 53.83 ! Tape # 4
```

```
*EVE 54  10:58  53 51.11  130 53.32 ! Change from LORAN to GPS
*TRA   F4      119    165   2820   5.984 140.839   0.783   7.639

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 47  2820  11.1  20.5  88.3  83.3  56.3  19.1   2.7 2.34E-04 1.95E-02 4.00E+02
157  9420  44.0  81.6  69.1  64.1  50.1  15.1   0.0 2.27E-04 1.45E-02 1.18E+03
*
*EVE 55  11:03  53 50.66  130 52.16 ! Waypoint
*
*EVE 56  11:23  53 48.83  130 49.91 ! Waypoint
*
*EVE 57  11:45  53 46.47  130 46.92 !
*TRA END
*
*EVE 58  11:51  53 46.04  130 47.91 !
*TRA   F5      172    209   2280   6.148 316.916   0.633   9.707

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 38  2280  11.4  21.1  90.7  85.7  74.0  10.3   6.5 3.11E-04 2.67E-02 5.62E+02
195 11700  55.4 102.7  73.5  68.5  57.8  13.5   0.0 2.48E-04 1.70E-02 1.75E+03
*
*EVE 59  12:10  53 48.24  130 51.46 ! Waypoint
*
*EVE 60  12:29  53 50.53  130 55.02 !
*TRA END
*
*EVE 61  12:39  53 49.81  130 55.94 !
*TRA   F6      220    278   3540   6.851 138.733   1.000   6.851

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 59  3540  12.7  23.5  83.3  78.3  61.2  18.1   5.5 7.90E-04 6.19E-02 1.45E+03
254 15240  68.1 126.2  75.3  70.3  59.3  15.6   0.0 3.61E-04 2.54E-02 3.20E+03
*
*EVE 62  13:05  53 47.40  130 52.31 ! Waypoint
*
*EVE 63  13:39  53 44.66  130 48.29 !
*TRA END
*
*EVE 64  13:52  53 44.65  130 50.63 !
*TRA   F7      292    328   2220   5.913 318.809   0.617   9.589

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 37  2220  11.0  20.3  68.7  63.7  67.1   6.3   6.6 1.17E-03 7.45E-02 1.51E+03
291 17460  79.1 146.4  74.4  69.4  61.8  12.6   0.0 4.63E-04 3.22E-02 4.71E+03
*
*EVE 65  14:11  53 46.88  130 53.98 ! Waypoint
*
*EVE 66  14:29  53 49.10  130 57.22 !
*TRA END
```

```
*EVE 67  14:40  53 48.43  130 58.76 !
*TRA   F8      341    380   2400   5.358 137.972   0.667   8.037

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 40  2400   9.9  18.4  47.4  42.4  12.9  35.1   3.9 1.97E-05 8.37E-04 1.54E+01
331 19860  89.0 164.8  71.4  66.4  61.7  12.7   0.0 4.32E-04 2.87E-02 4.73E+03
*
*EVE 68  14:59  53 46.65  130 55.99 ! Waypoint
*
*EVE 69  15:20  53 44.45  130 52.69 !
*TRA END
*
*EVE 70  15:43  53 44.03  130 52.84 ! WHITEROCK GRID - DUSK COVERAGE 1
*IDA HHERR04.D89
*! ---------------------------------------------------------------
*! Tra T-name  Seq1   Seq2    Pit     Dis     Bea   TimeD   Speed
*!               #      #      #      nm       o     hrs      kn
*! ---------------------------------------------------------------
*TRA   W1        4     32   1740   4.046  90.143   0.483   8.371
*ZER

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 #     #    km  km^2     m     m     m     m    km   kg/m^3   kg/m^2        t
 29  1740   7.5  13.9  88.7  83.7  47.9   9.3   1.1 1.92E-04 1.60E-02 2.23E+02
 29  1740   7.5  13.9  88.7  83.7  47.9   9.3   0.0 1.92E-04 1.60E-02 2.23E+02
*
*EVE 71  15:48  53 44.06  130 51.64 ! Sequence synchronization
*
*EVE 72  16:12  53 44.02  130 46.00 !
*TRA END
*
*EVE 73  16:26  53 43.00  130 44.52 !
*TRA   W2       47     84   2280   5.415 270.000   0.633   8.549

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 38  2280  10.0  18.6  83.7  78.7  50.8  39.2   4.5 2.07E-05 1.63E-03 3.02E+01
 67  4020  17.5  32.5  85.8  80.8  48.2  12.9   0.0 9.64E-05 7.79E-03 2.53E+02
*
*EVE 74  17:04  53 43.00  130 53.67 !
*TRA END
*
*EVE 75  17:15  53 42.04  130 53.47 ! Tape # 5
*TRA   W3       97    134   2280   6.003  89.714   0.650   9.236

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 38  2280  11.1  20.6  77.0  72.0  46.0   4.7   5.0 1.34E-03 9.62E-02 1.98E+03
105  6300  28.6  53.0  82.4  77.4  46.2   5.6   0.0 5.44E-04 4.21E-02 2.23E+03
*
*EVE 76  17:54  53 42.07  130 43.33 !
*TRA END
```

```
*EVE 77  18:07  53 41.02  130 43.55 !
*TRA   W4       148    183   2160   5.023 270.115   0.583   8.610

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 36  2160   9.3  17.2  76.4  71.4  45.9   7.0   5.6 9.75E-04 6.96E-02 1.20E+03
141  8460  37.9  70.3  80.9  75.9  46.1   6.1   0.0 6.44E-04 4.89E-02 3.43E+03
*
*EVE 78  18:42  53 41.03  130 52.03 !
*TRA END
*
*EVE 79  18:54  53 40.03  130 51.56 !
*TRA   W5       195    227   1980   5.054  90.568   0.550   9.189

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 33  1980   9.4  17.3  81.4  76.4  36.9  38.5   4.6 3.73E-05 2.85E-03 4.94E+01
174 10440  47.3  87.6  81.0  76.0  46.0   6.6   0.0 5.23E-04 3.98E-02 3.48E+03
*
*EVE 80  19:11  53 39.75  130 47.14 ! Course deviation for traffic
*
*EVE 81  19:27  53 39.98  130 43.03 !
*TRA END
*
*EVE 82  19:37  53 38.93  130 43.53 !
*TRA   W6       238    273   2160   4.944 270.000   0.600   8.239

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 36  2160   9.2  17.0  85.1  80.1  39.8   9.1   5.8 1.31E-03 1.05E-01 1.78E+03
210 12600  56.5 104.6  81.7  76.7  43.9   7.4   0.0 6.57E-04 5.04E-02 5.27E+03
*
*EVE 83  20:13  53 38.93  130 51.87 !
*TRA END
*
*EVE 84  20:25  53 38.04  130 51.66 !
*TRA   W7       286    316   1860   4.909  89.765   0.517   9.501

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 31  1860   9.1  16.8  86.6  81.6  42.3   5.0   2.7 4.57E-04 3.73E-02 6.28E+02
241 14460  65.5 121.4  82.3  77.3  43.7   7.2   0.0 6.28E-04 4.86E-02 5.90E+03
*
*EVE 85  20:56  53 38.06  130 43.38 !
*TRA END
*
*EVE 86  21:08  53 37.08  130 43.61 !
*TRA   W8       329    365   2220   5.074 268.307   0.600   8.457

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 37  2220   9.4  17.4  87.4  82.4  36.5   7.7   7.9 1.16E-03 9.53E-02 1.66E+03
278 16680  74.9 138.8  83.0  78.0  42.1   7.3   0.0 6.98E-04 5.44E-02 7.56E+01
*
*EVE 87  21:44  53 36.93  130 52.16 !
*TRA END
```

```
*EVE 88  21:56  53 33.72  130 52.20 ! Start-up integrator
*IDA HHERR05.D89
*
*EVE 89  22:04  53 34.62  130 51.66 ! BONILLA GRID - DAWN COVERAGE 1
*! ------------------------------------------------------------------
*! Tra T-name  Seq1   Seq2    Pit     Dis      Bea   TimeD   Speed
*!               #      #      #      nm        o     hrs      kn
*! ------------------------------------------------------------------
*TRA   B1       10     45   2160   5.151 122.794   0.617   8.354
*ZER

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 #     #    km  km^2     m     m     m     m    km   kg/m^3   kg/m^2        t
 36  2160   9.5  17.7 101.6  96.6  88.3  33.5   5.9 2.80E-05 2.71E-03 4.78E+01
 36  2160   9.5  17.7 101.6  96.6  88.3  33.5   0.0 2.80E-05 2.71E-03 4.78E+01
*
*EVE 90  22:24  53 33.14  130 47.68 ! Waypoint
*
*EVE 91  22:41  53 31.83  130 44.37 !
*TRA END
*
*EVE 92  22:53  53 31.05  130 45.73 !
*TRA   B2       58     90   1980   4.950 304.308   0.550   8.999

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 33  1980   9.2  17.0  93.3  88.3  69.5  13.7   5.3 1.31E-04 1.16E-02 1.97E+02
 69  4140  18.7  34.6  97.5  92.5  73.2  17.6   0.0 7.63E-05 7.06E-03 2.45E+02
*
*EVE 93  23:10  53 32.42  130 49.36 ! Waypoint
*
*EVE 94  23:26  53 33.84  130 52.61 ! Tape # 6
*TRA END
*
*EVE 95  23:40  53 33.12  130 54.03 !
*TRA   B3      105    139   2100   4.972 123.440   0.583   8.524

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 35  2100   9.2  17.1  80.7  75.7  65.2  14.0   5.2 1.13E-04 8.53E-03 1.45E+02
104  6240  27.9  51.7  92.0  87.0  70.2  16.2   0.0 8.67E-05 7.54E-03 3.90E+02
*
*EVE 96  00:15  53 30.38  130 47.05 !
*DAT 09-DEC-90
*TRA END
*
*EVE 97  00:29  53 29.66  130 48.72 !
*TRA   B4      154    185   1920   4.981 304.060   0.533   9.340

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 32  1920   9.2  17.1  76.2  71.2  61.2   8.8   6.2 1.37E-04 9.73E-03 1.66E+02
136  8160  37.1  68.8  88.1  83.1  67.5  14.0   0.0 9.73E-05 8.09E-03 5.56E+02
```

```
*EVE 98  00:44  53 26.65  130 51.84 ! Waypoint
*
*EVE 99  01:01   53 32.45  130 55.66 ! Longitude corrected
*TRA END
*
*EVE 100  01:11  53 31.68  130 56.73 !
*TRA   B5      196    231   2160   4.956 122.736   0.600   8.260

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 36  2160   9.2  17.0  74.5  69.5  52.3  13.0   2.7 1.97E-04 1.37E-02 2.32E+02
172 10320  46.3  85.8  85.4  80.4  63.0  13.7   0.0 1.14E-04 9.19E-03 7.89E+02
*
*EVE 101  01:27  53 30.52  130 53.65 ! Waypoint
*
*EVE 102  01:47  53 29.00  130 49.72 !
*TRA END
*
*EVE 103  01:58  53 28.20  130 51.24 !
*TRA   B6      244    273   1800   4.857 305.346   0.517   9.401

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 30  1800   9.0  16.7  78.1  73.1  45.3  29.7   5.1 2.67E-05 1.95E-03 3.25E+01
202 12120  55.3 102.4  84.2  79.2  62.3  14.4   0.0 1.01E-04 8.01E-03 8.21E+02
*
*EVE 104  02:11  53 29.40  130 53.89 ! Waypoint
*
*EVE 105  02:29  53 31.01  130 57.90 !
*TRA END
*
*EVE 106  02:41  53 30.27  130 59.51 !
*TRA   B7      286    322   2220   5.053 124.473   0.617   8.194

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 37  2220   9.4  17.3  76.6  71.6  51.7  25.3   4.6 2.60E-05 1.86E-03 3.23E+01
239 14340  64.7 119.8  83.1  78.1  61.9  14.8   0.0 9.12E-05 7.12E-03 8.53E+02
*
*EVE 107  03:03  53 28.50  130 55.23 ! Waypoint
*
*EVE 108  03:18  53 27.41  130 52.51 !
*TRA END
*
*EVE 109  03:28  53 26.66  130 54.03 !
*TRA   B8      333    365   1980   5.456 306.169   0.550   9.921

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 33  1980  10.1  18.7  76.5  71.5  65.8   9.0   5.9 1.61E-04 1.15E-02 2.16E+02
272 16320  74.8 138.5  82.2  77.2  62.7  13.6   0.0 1.00E-04 7.72E-03 1.07E+03
*
*EVE 110  03:50  53 28.78  130 58.78 ! Waypoint
*
*EVE 111  04:01  53 29.88  131 01.43 !
*TRA END
```

```
*EVE 112  04:13  53 29.11  131 03.12 !
*TRA   89      378    409   1920   4.300 124.253   0.533   8.062

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 32  1920   8.0  14.7  62.1  57.1  55.2  10.1   4.5 1.22E-04 6.98E-03 1.03E+02
304 18240  82.7 153.2  80.3  75.3  62.1  13.3   0.0 1.02E-04 7.65E-03 1.17E+03
*
*EVE 113  04:32  53 27.70  130 59.55 ! Waypoint
*
*EVE 114  04:45  53 26.69  130 57.15 !
*TRA END
*
*EVE 115  00:41  52 29.98  131 15.71 ! Start-up integrator
*DAT 10-DEC-90
*IDA HHERR06.DB9
*WID 0.5
*DEP 5,140
*EVE 116  00:59  52 30.17  131 20.15 ! JUAN PEREZ GRID - DAWN COVERAGE 1
*! ------------------------------------------------------------
*! Tra T-name  Seq1   Seq2    Pit     Dis     Bea   TimeD   Speed
*!               #      #      #      nm       o     hrs      kn
*! ------------------------------------------------------------
*TRA   J14      20     39   1200   2.983 258.395   0.333   8.950
*ZER

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 #     #    km  km^2     m     m     m     m    km   kg/m^3   kg/m^2        t
 20  1200   5.5   5.1 118.8 108.3  23.7  63.0   3.5 9.11E-03 9.86E-01 5.05E+03
 20  1200   5.5   5.1 118.8 108.3  23.7  63.0   0.0 9.11E-03 9.86E-01 5.05E+03
*
*EVE 117  01:19  52 29.57  131 24.95 !
*TRA   J13      40     78   2340   5.626 307.954   0.650   8.655

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 39  2340  10.4   9.6 151.2 122.3  44.8 104.9   5.2 6.96E-04 8.52E-02 8.22E+02
 59  3540  15.9  14.8 139.9 117.5  26.7  68.9   0.0 3.38E-03 3.97E-01 5.87E+03
*
*EVE 118  01:31  52 30.62  131 27.12 ! Tape # 7
*
*EVE 119  01:58  52 33.03  131 32.24 !
*TRA   J12      79     92    840   2.111 287.077   0.250   8.446

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 14   840   3.9   3.6  96.9  91.8  99.0  23.0   1.7 9.12E-04 8.37E-02 3.03E+02
 73  4380  19.9  18.4 131.5 112.4  30.2  66.6   0.0 2.99E-03 3.36E-01 6.17E+03
*
*EVE 120  02:13  52 33.65  131 35.56 ! Plotter reading from GPS until 04:50
*TRA END
```

```
*EVE 121  02:17  52 34.01  131 35.12 !
*TRA   J11      98    113    960   2.373 106.652   0.283   8.376

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 16   960   4.4   4.1 184.7 135.0  49.7 134.0   2.3 5.76E-04 7.77E-02 3.16E+02
 89  5340  24.2  22.5 141.1 116.5  31.2  69.9   0.0 2.48E-03 2.89E-01 6.49E+03
*
*EVE 122  02:34  52 33.33  131 31.38 ! Late event entry
*TRA   J10     114    149   2160   5.134 129.418   0.583   8.801

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 36  2160   9.5   8.8 209.0 134.8  46.2 153.5   4.5 1.63E-04 2.20E-02 1.93E+02
125  7500  33.8  31.3 160.2 121.6  31.6  72.3   0.0 1.76E-03 2.14E-01 6.68E+03
*
*EVE 123  03:09  52 30.07  131 24.86 ! Longitude corrected
*TRA   J9      150    172   1380   3.111  76.999   0.400   7.778

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 23  1380   5.8   5.3 153.8 129.8  24.7  90.8   1.1 4.81E-03 6.25E-01 3.33E+03
148  8880  39.5  36.6 159.3 122.8  29.3  78.5   0.0 2.23E-03 2.74E-01 1.00E+04
*
*EVE 124  03:33  52 30.77  131 19.88 !
*TRA END
*
*EVE 125  03:39  52 31.23  131 20.13 !
*TRA   J8      180    197   1080   2.834 257.153   0.317   8.949

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 18  1080   5.2   4.9 208.8 134.6 101.8  89.5   2.5 7.57E-05 1.02E-02 4.95E+01
166  9960  44.8  41.5 165.1 124.2  29.6  78.5   0.0 1.95E-03 2.43E-01 1.01E+04
*
*EVE 126  03:58  52 30.60  131 24.67 !
*TRA   J7      198    223   1560   4.087 309.691   0.483   8.456

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 26  1560   7.6   7.0 209.8 135.0  28.3 213.9   0.3 2.96E-03 4.00E-01 2.80E+03
192 11520  52.3  48.5 171.6 125.8  29.4 108.0   0.0 2.11E-03 2.65E-01 1.29E+04
*
*EVE 127  04:27  52 33.21  131 29.84 ! Integrator fails
*TRA END
*
*EVE 128  04:31  52 33.52  131 30.45 ! Restart integrator
*IDA HHERR07.D89
*
*EVE 129  04:32  52 33.70  131 30.80 !
*TRA END
```

```
*EVE 130  04:39  52 34.00  131 30.10 !
*TRA   J6        8     37   1800   4.517 129.279   0.517   8.743

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 30  1800   8.4   7.7 196.7 134.9  26.9 208.8   7.9 3.71E-03 5.00E-01 3.88E+03
222 13320  60.7  56.2 175.0 127.0  28.8 131.4   0.0 2.34E-03 2.98E-01 1.67E+04
*
*EVE 131  04:39  52 33.87  131 29.94 ! Sequence synchronization
*
*EVE 132  04:58  52 32.24  131 26.69 ! Change from GPS to LORAN
*
*EVE 133  05:10  52 31.14  131 24.35 ! Integrator fails
*TRA END       ! Start of J5
*
*EVE 134  05:36  52 32.15  131 19.69 ! Restart integrator
*IDA HHERR08.D89
*TRA END       ! Near beginning of J5/J4
*
*EVE 135  05:40  52 32.27  131 20.34 ! Integrator fails again
*TRA END        ! Start of J4
*
*EVE 136  05:44  52 32.10  131 21.30 ! Sequence synchronization
*
*EVE 137  06:19  52 33.65  131 28.28 ! Restart integrator again
*IDA HHERR09.D89
*TRA   J3        1      5    420   1.665 306.917   0.183   9.081

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
  7   420   3.1   2.9 119.5 108.5  80.9  17.7   0.7 9.23E-04 1.00E-01 2.86E+02
229 13740  63.8  59.1 172.3 126.1  29.7 129.5   0.0 2.29E-03 2.88E-01 1.70E+04
*
*EVE 138  06:25  52 34.16  131 29.52 !
*
*EVE 139  06:30  52 34.65  131 30.47 !
*TRA   J2        6     33   1680   3.850 321.677   0.467   8.249

 N     P   Len  Area  Rang   Col   Dcs   Lcb   Lcb    Vol D   Surf D  Biomass
 28  1680   7.1   6.6 120.7 113.8  29.7  84.2   5.1 7.88E-03 8.97E-01 5.92E+03
257 15420  70.9  65.7 167.2 124.9  29.7 117.8   0.0 2.80E-03 3.49E-01 2.29E+04
*
*EVE 140  06:34  52 35.01  131 30.98 ! Sequence synchronization
*
*EVE 141  06:58  52 37.67  131 34.40 !
*TRA END
*
*EVE 142  07:05  52 37.74  131 33.70 !
*TRA   J1       40     65   1560   4.019 139.368   0.433   9.275

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 26  1560   7.4   6.9 124.3 116.5  36.9  87.8   1.4 1.48E-03 1.73E-01 1.19E+03
283 16980  78.4  72.6 163.1 124.  30.0 116.3   0.0 2.68E-03 3.33E-01 2.41E+04
```

```
*EVE 143  07:31  52 34.69  131 29.39 !
*TRA END
*
*EVE 144  13:37  not avail  not avail ! Start-up, 20 m. bottom window
*IDA HHERR10.DB9                      ! Tape # 8
*
*EVE 145  14:09  52 34.90  131 29.40 ! JUAN PEREZ GRID - DUSK COVERAGE 1
*! ------------------------------------------------------------------
*! Tra T-name  Seq1   Seq2    Pit     Dis     Bea   TimeD   Speed
*!               #      #      #      nm       o     hrs      kn
*! ------------------------------------------------------------------
*TRA   J1       34     58   1500   3.992 319.603   0.417   9.580
*ZER

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 #     #    km  km^2     m     m     m     m    km   kg/m^3   kg/m^2        t
 25  1500   7.4   6.8  89.8  84.8  49.4  40.7   0.9 1.91E-03 1.62E-01 1.11E+03
 25  1500   7.4   6.8  89.8  84.8  49.4  40.7   0.0 1.91E-03 1.62E-01 1.11E+03
*
*EVE 146  14:25  52 36.81  131 32.07 ! Sequence synchronization
*
*EVE 147  14:34  52 37.94  131 33.66 !
*TRA END
*
*EVE 148  14:38  52 37.63  131 34.15 !
*TRA   J2       63     84   1320   3.664 141.320   0.383   9.558

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 22  1320   6.8   6.3 109.5 104.5  49.4  56.8   2.6 4.15E-03 4.34E-01 2.72E+03
 47  2820  14.2  13.1  99.2  94.2  49.4  52.1   0.0 3.10E-03 2.92E-01 3.84E+03
*
*EVE 149  15:01  52 34.77  131 30.38 !
*TRA   J3       85    115   1860   4.936 128.310   0.500   9.872

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 31  1860   9.1   8.5 129.0 12? 4  49.6  83.6   5.2 3.06E-03 3.75E-01 3.17E+03
 78  4680  23.3  21.6 110.9 105.3  49.5  66.4   0.0 3.08E-03 3.25E-01 7.01E+03
*
*EVE 150  15:08  52 34.06  131 28.87 ! Manual bottom from 100 m. to 150 m.
*
*EVE 151  15:31  52 31.71  131 24.01 !
*TRA   J4      116    132   1020   2.642  75.756   0.283   9.324

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 17  1020   4.9   4.5 121.3 116.3  89.9   8.6   1.1 1.21E-04 1.41E-02 6.38E+01
 95  5700  28.2  26.1 112.7 107.2  49.8  65.9   0.0 2.53E-03 2.71E-01 7.07E+03
*
*EVE 152  15:48  52 32.36  131 19.80 !
*TRA END
```

```
*EVE 153  15:53  52 31.83  131 19.99 !
*TRA   J5      138    154   1020   2.723 256.408   0.283   9.611

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 17  1020   5.0   4.7 139.3 134.3  79.8  59.5   3.7 1.15E-04 1.54E-02 7.19E+01
112  6720  33.3  30.8 116.8 111.3  50.1  65.8   0.0 2.08E-03 2.32E-01 7.15E+03
*
*EVE 154  16:10  52 31.19  131 24.34 !
*TRA   J6      155    182   1680   4.642 308.662   0.483   9.604

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 28  1680   8.6   8.0 139.3 134.3  57.0  82.1   2.1 4.33E-04 5.82E-02 4.63E+02
140  8400  41.9  38.8 121.4 116.0  50.5  66.8   0.0 1.69E-03 1.96E-01 7.61E+03
*
*EVE 155  16:39  52 34.09  131 30.30 !
*TRA END
*
*EVE 156  16:45  52 33.65  131 30.63 !
*TRA   J7      189    218   1800   4.762 128.121   0.483   9.853

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 30  1800   8.8   8.2 139.6 134.6  69.0  70.6   5.4 1.34E-04 1.81E-02 1.48E+02
170 10200  50.7  46.9 124.6 119.3  50.9  66.9   0.0 1.39E-03 1.65E-01 7.76E+03
*
*EVE 157  17:14  52 30.71  131 24.47 !
*TRA   J8      219    237   1140   2.966  78.132   0.333   8.898

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 19  1140   5.5   5.1 138.8 133.8  86.0  53.1   2.0 8.26E-05 1.11E-02 5.62E+01
189 11340  56.2  52.0 126.0 120.7  51.1  66.8   0.0 1.24E-03 1.50E-01 7.81E+03
*
*EVE 158  17:34  52 31.32  131 19.70 !
*TRA END
*
*EVE 159  17:38  52 30.79  131 19.70 !
*TRA   J9      243    261   1140   3.231 258.392   0.333   9.692

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 19  1140   6.0   5.5 135.7 130.7  38.8  78.2   5.4 1.12E-03 1.47E-01 8.13E+02
208 12480  62.1  57.6 126.9 121.7  50.0  67.8   0.0 1.23E-03 1.50E-01 8.63E+03
*
*EVE 160  17:58  52 30.14  131 24.90 !
*TRA   J10     262    295   2040   5.501 307.120   0.567   9.708

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 34  2040  10.2   9.4 138.5 133.5  32.0 106.7   1.7 6.87E-03 9.17E-01 8.65E+03
242 14520  72.3  67.0 128.5 123.3  41.0  87.3   0.0 2.09E-03 2.58E-01 1.73E+04
```

```
*EVE 161  18:32  52 33.46  131 32.11 !
*TRA   J11     296    310    900   1.387 300.789   0.233   5.944

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 15   900   2.6   2.4 139.0 134.0  49.1  89.9   1.3 8.43E-04 1.13E-01 2.69E+02
257 15420  74.9  69.4 128.9 123.7  41.1  87.3   0.0 2.05E-03 2.53E-01 1.75E+04
*
*EVE 162  18:46  52 34.17  131 34.07 ! Latitude corrected
*TRA END
*
*EVE 163  18:52  52 33.60  131 35.47 !
*TRA   J12     316    329    840   2.135 106.325   0.217   9.854

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 14   840   4.0   3.7 109.5 104.5  46.5  63.9   2.3 3.15E-04 3.29E-02 1.20E+02
271 16260  78.9  73.0 127.9 122.7  41.2  87.2   0.0 1.97E-03 2.42E-01 1.77E+04
*
*EVE 164  19:05  52 33.00  131 32.10 !
*TRA   J13     330    364   2100   5.697 126.768   0.583   9.766

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 35  2100  10.6   9.8 125.1 120.1  42.0  81.0   6.1 3.12E-04 3.74E-02 3.66E+02
306 18360  89.4  82.8 127.6 122.4  41.2  87.0   0.0 1.78E-03 2.18E-01 1.80E+04
*
*EVE 165  19:40  52 29.59  131 24.60 ! Tape # 9
*TRA   J14     365    382   1080   2.855  77.047   0.317   9.016

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 18  1080   5.3   4.9 107.7 102.7  68.5  20.2   2.0 1.14E-04 1.17E-02 5.74E+01
324 19440  94.7  87.7 126.5 121.3  41.3  86.8   0.0 1.70E-03 2.06E-01 1.81E+04
*
*EVE 166  19:59  52 30.23  131 20.03 !
*TRA END
*
*EVE 167  02:09  52 36.70  131 31.92 ! Start-up integrator
*DAT 11-DEC-90
*IDA HHERR11.D89
*
*EVE 168  02:15  not avail not avail ! Turning back to restart transect
*
*EVE 169  02:37  52 34.14  131 29.40 ! Sequence synchronization
```

```
*EVE 170  02:45  52 34.94  131 29.58 ! JUAN PEREZ GRID - DAWN COVERAGE 2
*! ------------------------------------------------------------
*! Tra T-name  Seq1   Seq2    Pit     Dis     Bea   TimeD   Speed
*!               #      #      #      nm       o     hrs      kn
*! ------------------------------------------------------------
*TRA   J1       37     61   1500   3.969 321.821   0.417   9.526
*ZER

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 #     #    km  km^2     m     m     m     m    km   kg/m^3   kg/m^2        t
 25  1500   7.4   6.8 110.0 105.0  31.4  84.3   6.2 5.72E-03 6.01E-01 4.09E+03
 25  1500   7.4   6.8 110.0 105.0  31.4  84.3   0.0 5.72E-03 6.01E-01 4.09E+03
*
*EVE 171  03:10  52 38.06  131 33.62 !
*TRA END
*
*EVE 172  03:15  52 37.65  131 34.11 !
*TRA   J2       68     91   1440   3.660 141.641   0.417   8.784

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 24  1440   6.8   6.3 103.2  98.2  29.3  74.0   1.6 6.96E-03 6.83E-01 4.29E+03
 49  2940  14.1  13.1 106.7 101.7  30.3  79.1   0.0 6.29E-03 6.40E-01 8.38E+03
*
*EVE 173  03:40  52 34.78  131 30.37 !
*TRA   J3       92    126   2100   5.015 126.739   0.583   8.597

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 35  2100   9.3   8.6 124.8 119.8  41.9  73.4   2.5 1.07E-03 1.28E-01 1.10E+03
 84  5040  23.4  21.7 113.9 108.9  31.7  78.4   0.0 4.01E-03 4.37E-01 9.48E+03
*
*EVE 174  04:15  52 31.78  131 23.76 !
*TRA   J4      127    142    960   2.526  77.190   0.267   9.473

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 16   960   4.7   4.3 117.1 112.1  21.9  58.3   1.4 1.54E-03 1.73E-01 7.49E+02
100  6000  28.1  26.0 114.4 109.4  31.0  76.9   0.0 3.59E-03 3.93E-01 1.02E+04
*
*EVE 175  04:31  52 32.34  131 19.71 !
*TRA END
*
*EVE 176  04:38  52 31.80  131 20.09 !
*TRA   J5      150    167   1080   2.810 258.091   0.300   9.368

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 18  1080   5.2   4.8 139.0 134.0  89.2  49.8   3.2 9.84E-05 1.32E-02 6.36E+01
118  7080  33.3  30.8 118.3 113.3  31.3  76.8   0.0 2.95E-03 3.34E-01 1.03E+04
```

```
*EVE 177  04:56  52 31.22  131 24.61 !
*TRA   J6       168    197    1800   4.565 306.419   0.500   9.129

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 30  1800   8.5   7.8 139.0 134.0  30.7 108.2   5.6 5.71E-03 7.65E-01 5.99E+03
148  8880  41.8  38.7 122.5 117.5  31.1  88.3   0.0 3.58E-03 4.21E-01 1.63E+04
*
*EVE 178  05:26  52 33.93  131 30.65 !
*TRA END
*
*EVE 179  05:30  52 33.63  131 30.82 !
*TRA   J7       203    235    1980   4.903 126.260   0.567   8.653

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 33  1980   9.1   8.4 139.0 134.0  34.9 104.1   3.9 5.03E-03 6.74E-01 5.67E+03
181 10860  50.8  47.1 125.4 120.4  32.1  92.4   0.0 3.87E-03 4.66E-01 2.19E+04
*
*EVE 180  06:04  52 30.73  131 24.32 !
*TRA   J8       236    255    1200   2.811  78.717   0.317   8.877

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 20  1200   5.2   4.8 138.8 133.8  84.7  54.2   2.2 4.86E-05 6.49E-03 3.13E+01
201 12060  56.0  51.9 126.7 121.7  32.2  92.4   0.0 3.48E-03 4.24E-01 2.20E+04
*
*EVE 181  06:23  52 31.28  131 19.79 !
*TRA END
*
*EVE 182  06:28  52 30.94  131 20.00 ! Entered 5 min late AND corrected
*TRA   J9       261    282    1320   3.057 252.879   0.383   7.975

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 22  1320   5.7   5.2 134.5 129.5  80.4  38.0   3.8 2.08E-04 2.70E-02 1.41E+02
223 13380  61.7  57.1 127.4 122.4  32.5  92.0   0.0 3.16E-03 3.87E-01 2.21E+04
*
*EVE 183  06:51  52 30.04  131 24.80 ! Corrected, entered late
*TRA   J10      283    317    2100   5.587 307.871   0.583   9.578

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 35  2100  10.3   9.6 138.7 133.7  46.0  92.9   5.8 5.68E-04 7.60E-02 7.28E+02
258 15480  72.0  66.7 129.0 124.0  32.9  92.0   0.0 2.76E-03 3.42E-01 2.28E+04
*
*EVE 184  07:26  52 33.47  131 32.05 !
*TRA   J11      318    332     900   2.165 285.542   0.250   8.658

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 15   900   4.0   3.7 136.4 131.4  36.8  96.3   1.3 7.35E-03 9.66E-01 3.59E+03
273 16380  76.1  70.4 129.4 124.4  33.4  92.6   0.0 3.02E-03 3.75E-01 2.64E+04
*
*EVE 185  07:41  52 34.05  131 35.48 !
*TRA END
```

```
*EVE 186  07:47  52 33.62  131 35.41 !
*TRA   J12     339    354    960   2.403 108.432   0.267   9.013

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 16   960   4.5   4.1 119.1 114.1  58.0  66.5   2.0 6.38E-04 7.28E-02 3.00E+02
289 17340  80.5  74.6 128.8 123.8  33.7  92.3   0.0 2.90E-03 3.59E-01 2.67E+04
*
*EVE 187  07:53  52 33.33  131 34.02 ! Tape # 10
*
*EVE 188  08:03  52 32.86  131 31.66 !
*TRA   J13     355    390   2160   5.230 128.566   0.600   8.716

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 36  2160   9.7   9.0 127.0 122.0  95.0  15.8   6.9 2.63E-04 3.21E-02 2.88E+02
325 19500  90.2  83.5 128.6 123.6  34.4  91.5   0.0 2.62E-03 3.24E-01 2.70E+04
*
*EVE 189  08:39  52 29.60  131 24.94 ! Longitude corrected
*TRA   J14     391    411   1260   3.208  77.762   0.350   9.166

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 21  1260   5.9   5.5 111.2 106.2  90.4  11.9   2.6 1.05E-04 1.12E-02 6.15E+01
346 20760  96.1  89.0 127.5 122.5  34.5  91.3   0.0 2.48E-03 3.04E-01 2.71E+04
*
*EVE 190  09:00  52 30.28  131 19.79 !
*TRA END
*
*EVE 191  13:56  52 34.47  131 29.18 ! Start-up integrator
*IDA HHERR12.D89
*
*EVE 192  13:58  52 34.79  131 29.44 ! JUAN PEREZ GRID - DUSK COVERAGE 2
*! ---------------------------------------------------------------
*! Tra T-name  Seq1   Seq2    Pit     Dis     Bea   TimeD   Speed
*!               #      #      #      nm       o     hrs      kn
*! ---------------------------------------------------------------
*TRA   J1        3     28   1560   4.185 321.172   0.417  10.043
*ZER

 #     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 #     #    km  km^2     m     m     m     m    km   kg/m^3   kg/m^2        t
 26  1560   7.8   7.2 111.4 106.4  50.0  72.1   6.7 5.77E-03 6.14E-01 4.41E+03
 26  1560   7.8   7.2 111.4 106.4  50.0  72.1   0.0 5.77E-03 6.14E-01 4.41E+03
*
*EVE 193  14:23  52 38.05  131 33.76 !
*TRA END
*
*EVE 194  14:28  52 37.60  131 34.08 !
*TRA   J2       33     56   1440   3.571 141.384   0.400   8.927

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 24  1440   6.6   6.1 106.3 101.3  50.7  56.4   2.3 5.23E-03 5.30E-01 3.24E+03
 50  3000  14.4  13.3 109.1 104.1  50.3  65.4   0.0 5.53E-03 5.75E-01 7.65E+03
```

```
*EVE 195  14:52  52 34.81  131 30.41 !
*TRA   J3        57     89    1980   4.974 128.406   0.550   9.043

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb     Vol D   Surf D  Biomass
 33  1980   9.2   8.5 126.9 121.9  66.9  68.4   7.5 4.37E-03 5.32E-01 4.54E+03
 83  4980  23.6  21.8 116.1 111.1  56.5  66.5   0.0 5.03E-03 5.59E-01 1.22E+04
*
*EVE 196  14:54  52 34.58  131 29.94 ! Sequence synchronization
*
*EVE 197  15:25  52 31.72  131 24.00 !
*TRA   J4        90    106    1020   2.573  76.288   0.283   9.082

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb     Vol D   Surf D  Biomass
 17  1020   4.8   4.4 118.9 113.9 102.5  32.6   0.4 2.48E-03 2.82E-01 1.24E+03
100  6000  28.3  26.2 116.5 111.5  60.7  63.4   0.0 4.59E-03 5.12E-01 1.34E+04
*
*EVE 198  15:42  52 32.33  131 19.89 !
*TRA END
*
*EVE 199  15:48  52 31.80  131 20.09 !
*TRA   J5       113    130    1080   2.691 256.461   0.300   8.969

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb     Vol D   Surf D  Biomass
 18  1080   5.0   4.6 139.0 134.0  92.3  46.8   3.3 3.60E-05 4.83E-03 2.23E+01
118  7080  33.3  30.9 119.9 114.9  60.8  63.4   0.0 3.80E-03 4.36E-01 1.35E+04
*
*EVE 200  16:06  52 31.17  131 24.39 !
*TRA   J6       131    159    1740   4.578 308.505   0.483   9.471

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb     Vol D   Surf D  Biomass
 29  1740   8.5   7.9 139.0 134.0  98.9  40.1   2.0 4.14E-03 5.54E-01 4.35E+03
147  8820  41.8  38.7 123.8 118.8  70.1  57.7   0.0 3.87E-03 4.60E-01 1.78E+04
*
*EVE 201  16:35  52 34.02  131 30.28 !
*TRA END
*
*EVE 202  16:41  52 33.66  131 30.73 !
*TRA   J7       166    198    1980   4.917 129.690   0.550   8.940

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb     Vol D   Surf D  Biomass
 33  1980   9.1   8.4 139.1 134.1  88.6  50.5   3.8 5.89E-03 7.90E-01 6.66E+03
180 10800  50.9  47.1 126.5 121.5  75.1  55.7   0.0 4.27E-03 5.19E-01 2.45E+04
*
*EVE 203  17:14  52 30.52  131 24.51 !
*TRA   J8       199    219    1260   2.891  74.555   0.350   8.261

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb     Vol D   Surf D  Biomass
 21  1260   5.4   5.0 138.9 133.9  55.9  83.2   2.3 4.53E-04 6.06E-02 3.01E+02
201 12060  56.3  52.1 127.7 122.7  74.9  56.1   0.0 3.88E-03 4.76E-01 2.48E+04
*
*EVE 204  17:35  52 31.29  131 19.93 !
*TRA END
```

```
*EVE 205  17:43  52 30.73  131 20.16 !
*TRA   J9      228    246   1140   2.972 256.579   0.317   9.386

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 19  1140   5.5   5.1 134.7 129.7  88.0  34.2   3.8 1.37E-04 1.77E-02 9.03E+01
220 13200  61.8  57.2 128.3 123.3  75.0  56.0   0.0 3.53E-03 4.35E-01 2.49E+04
*
*EVE 206  18:02  52 30.04  131 24.91 !
*TRA   J10     247    282   2160   5.484 309.655   0.600   9.140

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 36  2160  10.2   9.4 138.1 133.1  27.5 111.2   4.2 8.61E-04 1.15E-01 1.08E+03
256 15360  71.9  66.6 129.7 124.7  73.0  58.3   0.0 3.12E-03 3.90E-01 2.59E+04
*
*EVE 207  18:38  52 33.54  131 31.85 !
*TRA   J11     283    297    900   2.315 283.743   0.233   9.922

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 15   900   4.3   4.0 137.2 132.2  26.6 111.7   0.7 9.41E-03 1.24E+00 4.94E+03
271 16260  76.2  70.6 130.1 125.1  65.6  66.8   0.0 3.50E-03 4.38E-01 3.09E+04
*
*EVE 208  18:52  52 34.09  131 35.55 !
*TRA END
*
*EVE 209  18:59  52 33.56  131 35.32 ! Tape # 11
*TRA   J12     304    317    840   2.089 105.549   0.233   8.954

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 14   840   3.9   3.6 112.0 107.0  22.8  86.2   2.7 2.18E-03 2.34E-01 8.38E+02
285 17100  80.1  74.2 129.3 124.3  64.4  67.3   0.0 3.44E-03 4.28E-01 3.17E+04
*
*EVE 210  19:13  52 33.00  131 32.01 !
*TRA   J13     318    356   2340   5.594 129.255   0.650   8.607

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 39  2340  10.4   9.6 122.2 117.2  48.9  68.7   2.7 1.79E-04 2.10E-02 2.01E+02
324 19440  90.4  83.7 128.4 123.4  64.3  67.3   0.0 3.09E-03 3.81E-01 3.19E+04
*
*EVE 211  19:52  52 29.46  131 24.89 !
*TRA   J14     357    380   1440   3.090  75.377   0.400   7.725

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 24  1440   5.7   5.3 107.7 102.7  73.6  23.7   2.4 1.63E-04 1.67E-02 8.85E+01
348 20880  96.2  89.0 127.2 122.2  64.4  67.2   0.0 2.94E-03 3.59E-01 3.20E+04
*
*EVE 212  20:16  52 30.24  131 19.98 !
*TRA END
*
*EVE 213  01:52  52 30.00  131 22.25 ! Start-up integrator
*DAT 12-DEC-90
*IDA HHERR13.D89
```

```
*EVE 214  02:06  52 29.15  131 19.90 ! PEREZ ENTRANCE GRID - DAWN COVERAGE 1
*! ------------------------------------------------------------------
*! Tra T-name  Seq1   Seq2    Pit     Dis     Bea   TimeD   Speed
*!               #      #      #      nm       o     hrs      kn
*! ------------------------------------------------------------------
*TRA   P9       16     46   1860   4.954  99.997   0.533   9.288
*ZER

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
  #     #    km  km^2     m     m     m     m    km   kg/m^3   kg/m^2        t
 31  1860   9.2   8.5  64.1  59.1  39.4  34.9   3.0 2.98E-05 1.76E-03 1.50E+01
 31  1860   9.2   8.5  64.1  59.1  39.4  34.9   0.0 2.98E-05 1.76E-03 1.50E+01
*
*EVE 215  02:10  52 29.05  131 18.96 ! Sequence synchronization
*
*EVE 216  02:38  52 28.29  131 11.89 !
*TRA END
*
*EVE 217  02:43  52 28.79  131 12.07 !
*TRA   P8       53     89   2220   4.943 281.672   0.617   8.015

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 37  2220   9.2   8.5  80.0  75.0  54.1  33.2   5.3 3.23E-05 2.43E-03 2.06E+01
 68  4080  18.3  17.0  72.1  67.1  47.9  33.9   0.0 3.12E-05 2.09E-03 3.55E+01
*
*EVE 218  03:06  52 29.41  131 16.91 ! Waypoint
*
*EVE 219  03:20  52 29.79  131 20.02 !
*TRA END
*
*EVE 220  03:28  52 30.22  131 20.03 !
*TRA   P7       98    128   1860   5.045 100.045   0.517   9.765

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 31  1860   9.3   8.7 100.3  95.3  73.1  37.3   3.6 4.85E-05 4.62E-03 4.00E+01
 99  5940  27.7  25.6  81.6  76.6  61.2  35.7   0.0 3.35E-05 2.95E-03 7.55E+01
*
*EVE 221  03:59  52 29.34  131 11.87 !
*TRA END
*
*EVE 222  04:06  52 29.87  131 12.25 !
*TRA   P6      136    172   2220   5.010 280.583   0.617   8.124

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 37  2220   9.3   8.6  98.4  93.4  78.7  33.4   5.6 3.82E-05 3.57E-03 3.07E+01
136  8160  37.0  34.2  85.8  80.8  66.3  35.1   0.0 3.84E-05 3.10E-03 1.06E+02
*
*EVE 223  04:43  52 30.79  131 20.34 !
*TRA END
```

```
*EVE 224  04:50  52 31.23  131 19.93 !
*TRA   P5      179    210   1920   4.991  99.456   0.533   9.359

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 32  1920   9.2   8.6 128.9 123.9  88.8  40.7   4.7 4.64E-05 5.75E-03 4.92E+01
168 10080  46.2  42.8  94.4  89.4  73.4  36.8   0.0 4.06E-05 3.63E-03 1.55E+02
*
*EVE 225  05:22  52 30.41  131 11.84 !
*TRA END
*
*EVE 226  05:29  52 30.92  131 12.15 !
*TRA   P4      219    254   2160   5.163 280.602   0.600   8.605

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 36  2160   9.6   8.9 136.1 131.1  91.3  44.8   5.0 2.48E-05 3.26E-03 2.88E+01
204 12240  55.8  51.6 101.6  96.6  76.2  38.1   0.0 3.69E-05 3.57E-03 1.84E+02
*
*EVE 227  06:05  52 31.87  131 20.49 !
*TRA END
*
*EVE 228  06:11  52 32.41  131 19.95 !
*TRA   P3      260    290   1860   4.931 101.226   0.517   9.543

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 31  1860   9.1   8.5 138.3 133.3  83.8  54.6   3.1 3.76E-05 5.01E-03 4.24E+01
235 14100  64.9  60.1 106.8 101.8  77.6  41.2   0.0 3.71E-05 3.77E-03 2.27E+02
*
*EVE 229  06:36  52 31.66  131 13.90 ! Tape # 12
*
*EVE 230  06:42  52 31.45  131 12.00 ! Entered 5 min late AND corrected
*TRA END
*
*EVE 231  06:47  52 31.96  131 12.00 ! Entered 8 min late AND corrected
*TRA   P2      296    328   1980   4.334 281.581   0.550   7.879

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 33  1980   8.0   7.4 138.7 133.7  91.4  47.1   3.5 3.60E-05 4.81E-03 3.58E+01
268 16080  72.9  67.5 110.3 105.3  79.5  42.0   0.0 3.69E-05 3.89E-03 2.62E+02
*
*EVE 232  07:20  52 32.83  131 18.98 !
*TRA END
*
*EVE 233  07:25  52 33.32  131 18.57 !
*TRA   P1      334    360   1620   4.042 101.268   0.450   8.983

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 27  1620   7.5   6.9 109.1 104.1  82.4  27.5   4.0 7.38E-05 7.68E-03 5.32E+01
295 17700  80.4  74.5 110.2 105.2  80.0  39.6   0.0 4.03E-05 4.24E-03 3.16E+02
*
*EVE 234  07:52  52 32.53  131 12.05 !
*TRA END
```

```
*EVE 235  13:31  52 30.02  131 20.85 ! Start-up integrator
*IDA HHERR14.DB9
*
*EVE 236  13:42  52 30.24  131 19.59 ! JUAN PEREZ GRID - DUSK COVERAGE 3
*! ------------------------------------------------------------------
*! Tra T-name  Seq1   Seq2    Pit     Dis     Bea   TimeD   Speed
*!               #      #      #      nm       o     hrs      kn
*! ------------------------------------------------------------------
*TRA   J14      12     31   1200   3.306 257.420   0.350   9.446
*ZER

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 #     #    km  km^2     m     m     m     m    km   kg/m^3   kg/m^2        t
 20  1200   6.1   5.7 114.2 109.2 103.7   8.4   3.2 1.62E-04 1.77E-02 1.00E+02
 20  1200   6.1   5.7 114.2 109.2 103.7   8.4   0.0 1.62E-04 1.77E-02 1.00E+02
*
*EVE 237  14:03  52 29.52  131 24.89 !
*TRA   J13     32     69   2280   5.666 308.279   0.617   9.188

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 38  2280  10.5   9.7 120.4 115.4  46.4  44.8  10.0 1.86E-03 2.15E-01 2.09E+03
 58  3480  16.6  15.4 118.1 113.1  49.0  43.1   0.0 1.26E-03 1.42E-01 2.19E+03
*
*EVE 238  14:10  52 30.13  131 26.38 ! Sequence synchronization
*
*EVE 239  14:40  52 33.03  131 32.20 !
*TRA   J12     70     82    780   2.060 285.199   0.233   8.830

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 13   780   3.8   3.5 104.5  99.5  48.2  49.8   1.1 3.65E-03 3.63E-01 1.28E+03
 71  4260  20.4  18.9 115.6 110.6  48.7  45.6   0.0 1.66E-03 1.83E-01 3.47E+03
*
*EVE 240  14:54  52 33.57  131 35.47 !
*TRA END
*
*EVE 241  14:59  52 34.08  131 35.31 !
*TRA   J11     88    102    900   2.438 105.218   0.250   9.752

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 15   900   4.5   4.2 131.6 126.6 104.3  21.2   3.2 6.10E-04 7.72E-02 3.23E+02
 86  5160  24.9  23.1 118.5 113.5  53.4  43.5   0.0 1.45E-03 1.64E-01 3.79E+03
*
*EVE 242  15:14  52 33.44  131 31.44 !
*TRA   J10    103    134   1920   5.357 129.539   0.533  10.044

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 32  1920   9.9   9.2 138.9 133.9 100.1  38.9   3.2 4.40E-05 5.89E-03 5.41E+01
118  7080  34.9  32.3 124.3 119.3  54.1  43.4   0.0 9.99E-04 1.19E-01 3.85E+03
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*EVE 243  15:46  52 30.03  131 24.65 !
*TRA  J9      135    153    1140   2.964  75.744   0.317   9.360

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 19  1140   5.5   5.1 133.9 128.9 104.8  30.5   2.9 1.71E-05 2.21E-03 1.12E+01
137  8220  40.4  37.4 125.6 120.6  54.2  43.4   0.0 8.56E-04 1.03E-01 3.86E+03
*
*EVE 244  16:05  52 30.76  131 19.93 !
*TRA END
*
*EVE 245  16:11  52 31.26  131 20.08 !
*TRA  J8      160    177    1080   2.884 256.568   0.300   9.614

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 18  1080   5.3   4.9 136.3 131.3 118.0  12.7   2.2 6.95E-05 9.13E-03 4.52E+01
155  9300  45.7  42.3 126.9 121.9  55.0  43.0   0.0 7.57E-04 9.22E-02 3.90E+03
*
*EVE 246  16:29  52 30.59  131 24.69 !
*TRA  J7      178    207    1800   4.847 309.600   0.500   9.695

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 30  1800   9.0   8.3 139.3 134.3  74.4  65.0   6.2 1.21E-04 1.62E-02 1.35E+02
185 11100  54.7  50.6 128.9 123.9  55.6  43.8   0.0 6.44E-04 7.98E-02 4.04E+03
*
*EVE 247  16:59  52 33.68  131 30.83 !
*TRA END
*
*EVE 248  17:03  52 33.94  131 30.18 !
*TRA  J6      212    239    1680   4.522 129.225   0.467   9.691

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 28  1680   8.4   7.8 138.2 133.2  82.3  56.4   3.4 1.91E-04 2.55E-02 1.98E+02
213 12780  63.0  58.4 130.1 125.1  56.9  44.4   0.0 5.80E-04 7.26E-02 4.24E+03
*
*EVE 249  17:31  52 31.08  131 24.42 !
*TRA  J5      240    257    1080   2.893  73.951   0.300   9.645

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 18  1080   5.4   5.0 139.6 134.6  91.1  48.5   1.8 9.82E-05 1.32E-02 6.56E+01
231 13860  68.4  63.3 130.9 125.9  57.4  44.4   0.0 5.39E-04 6.79E-02 4.30E+03
*
*EVE 250  17:49  52 31.88  131 19.85 !
*TRA END
*
*EVE 251  17:54  52 32.29  131 20.14 !
*TRA  J4      263    277     900   2.527 257.193   0.250  10.107

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 15   900   4.7   4.3 119.0 114.0 101.4  -3.8   3.2 1.72E-04 1.96E-02 8.48E+01
246 14760  73.1  67.7 130.1 125.1  58.2  43.5   0.0 5.18E-04 6.48E-02 4.39E+03
```

```
*EVE 252  18:09  52 31.73  131 24.19 !
*TRA   J3       278    307    1800   4.917 308.489   0.500   9.834

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 30  1800   9.1   8.4 128.9 123.9  25.7  85.9   6.2 1.31E-02 1.62E+00 1.37E+04
276 16560  82.2  76.1 130.0 125.0  33.6  75.6   0.0 1.90E-03 2.37E-01 1.80E+04
*
*EVE 253  18:28  52 33.68  131 28.26 ! Tape # 13
*
*EVE 254  18:39  52 34.79  131 30.52 !
*TRA   J2       308    330    1380   3.703 322.291   0.383   9.661

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 23  1380   6.9   6.4 108.8 103.8  26.6  74.0   5.5 1.38E-02 1.43E+00 9.10E+03
299 17940  89.1  82.5 128.4 123.4  31.3  75.1   0.0 2.67E-03 3.29E-01 2.71E+04
*
*EVE 255  19:02  52 37.72  131 34.25 !
*TRA END
*
*EVE 256  19:07  52 37.96  131 33.54 !
*TRA   J1       336    360    1500   4.073 140.887   0.417   9.774

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 25  1500   7.5   7.0 114.4 109.4  30.7  83.2   0.9 1.78E-02 1.95E+00 1.36E+04
324 19440  96.6  89.4 127.3 122.3  31.1  77.8   0.0 3.73E-03 4.56E-01 4.08E+04
*
*EVE 257  19:32  52 34.80  131 29.31 !
*TRA END
*
*EVE 258  00:19  52 30.41  131 22.21 ! Start cal: -20 dB, pulse,
*DAT 13-DEC-90                       ! 3 m. separation, rx gain -12dB
*IDA HHERR15.D89
*
*EVE 259  00:27  52 30.40  131 24.23 ! Cont. cal: switch from pulse to CW
*
*EVE 260  00:37  52 31.42  131 26.13 ! End calibration
*
*EVE 261  01:40  52 33.88  131 29.03 ! Start up integrator
*IDA HHERR16.D89
*
*EVE 262  01:46  52 34.83  131 29.47 ! JUAN PEREZ GRID - DAWN COVERAGE 3
*! ------------------------------------------------------------
*! Tra T-name  Seq1   Seq2    Pit     Dis     Bea   TimeD   Speed
*!               #      #      #      nm       o     hrs      kn
*! ------------------------------------------------------------
*TRA   J1         7     32   1560   4.069 321.398   0.433   9.390
*ZER

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 #     #    km  km^2     m     m     m     m    km  kg/m^3   kg/m^2        t
 26  1560   7.5   7.0 109.2 104.2  32.6  89.1   6.7 3.47E-03 3.62E-01 2.52E+03
 26  1560   7.5   7.0 109.2 104.2  32.6  89.1   0.0 3.47E-03 3.62E-01 2.52E+03
```

```
*EVE 263  01:49  52 35.11  131 29.83 ! Sequence synchronization
*
*EVE 264  02:12  52 38.01  131 33.65 !
*TRA END
*
*EVE 265  02:15  52 38.00  131 34.13 ! Set to manual bottom track - 150 m.
*
*EVE 266  02:16  52 37.75  131 34.21 ! Set back to auto/manual bot track
*
*EVE 267  02:17  52 37.69  131 34.22 ! Entered 4 min late AND corrected
*TRA   J2        38     61    1440   3.783 141.245   0.400   9.457

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 24  1440   7.0   6.5 101.0  96.0  43.2  58.0   3.5 1.28E-03 1.23E-01 8.00E+02
 50  3000  14.5  13.5 105.3 100.3  35.1  81.6   0.0 2.46E-03 2.47E-01 3.32E+03
*
*EVE 268  02:41  52 34.74  131 30.32 !
*TRA   J3        62     92    1860   4.943 127.952   0.533   9.268

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 31  1860   9.2   8.5 120.3 115.3  24.5  72.9   2.8 1.72E-02 1.98E+00 1.68E+04
 81  4860  23.7  21.9 111.1 106.1  26.2  74.4   0.0 8.64E-03 9.16E-01 2.01E+04
*
*EVE 269  03:13  52 31.70  131 23.91 !
*TRA   J4        93    109    1020   2.605  74.640   0.267   9.770

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 17  1020   4.8   4.5 121.8 116.8  90.4  22.2   1.4 1.79E-04 2.09E-02 9.32E+01
 98  5880  28.5  26.4 112.9 107.9  26.5  74.1   0.0 7.09E-03 7.65E-01 2.02E+04
*
*EVE 270  03:29  52 32.39  131 19.78 !
*TRA END
*
*EVE 271  03:34  52 31.85  131 20.00 ! Entered 4 min late AND corrected
*TRA   J5       115    135    1260   2.817 255.402   0.350   8.049

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 21  1260   5.2   4.8 139.3 134.3  63.7  75.6   2.4 7.10E-05 9.54E-03 4.61E+01
119  7140  33.7  31.2 117.0 112.0  26.6  74.1   0.0 5.79E-03 6.48E-01 2.02E+04
*
*EVE 272  03:55  52 31.14  131 24.48 !
*TRA   J6       136    166    1860   4.647 309.569   0.517   8.993

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 31  1860   8.6   8.0 139.3 134.3  26.9 112.4   7.0 1.10E-03 1.47E-01 1.18E+03
150  9000  42.3  39.2 121.5 116.5  26.6  76.2   0.0 4.69E-03 5.46E-01 2.14E+04
*
*EVE 273  04:26  52 34.10  131 30.37 !
*TRA END
```

```
*EVE 274  04:32  52 33.69  131 30.69 !
*TRA   J7      173    202   1800   4.827 127.677   0.500   9.653

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 30  1800   8.9   8.3 139.3 134.3  26.7 112.5   1.4 6.70E-03 9.00E-01 7.45E+03
180 10800  51.3  47.5 124.6 119.6  26.7  85.6   0.0 5.08E-03 6.08E-01 2.89E+04
*
*EVE 275  05:02  52 30.74  131 24.41 !
*TRA   J8      203    221   1140   3.079  78.004   0.333   9.237

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 19  1140   5.7   5.3 139.3 134.3  82.5  56.8   2.7 3.46E-05 4.64E-03 2.45E+01
199 11940  57.0  52.8 126.1 121.1  26.7  85.6   0.0 4.52E-03 5.48E-01 2.89E+04
*
*EVE 276  05:22  52 31.38  131 19.46 !
*TRA END
*
*EVE 277  05:28  52 30.71  131 20.11 !
*TRA   J9      229    249   1260   2.935 257.609   0.350   8.387

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 21  1260   5.4   5.0 133.7 128.7 100.2  29.4   3.7 1.16E-04 1.50E-02 7.54E+01
220 13200  62.4  57.8 126.7 121.7  26.9  85.4   0.0 4.12E-03 5.01E-01 2.90E+04
*
*EVE 278  05:49  52 30.08  131 24.82 !
*TRA   J10     250    286   2220   5.444 308.642   0.617   8.829

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 37  2220  10.1   9.3 138.3 133.3  46.2  92.0   6.2 1.94E-04 2.59E-02 2.42E+02
257 15420  72.5  67.1 128.4 123.4  27.1  85.5   0.0 3.53E-03 4.35E-01 2.92E+04
*
*EVE 279  06:26  52 33.48  131 31.81 !
*TRA   J11     287    301    900   2.195 284.245   0.250   8.781

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 15   900   4.1   3.8 135.3 130.3  46.5  88.2   1.5 1.73E-03 2.25E-01 8.47E+02
272 16320  76.6  70.9 128.7 123.7  27.6  85.5   0.0 3.43E-03 4.24E-01 3.01E+04
*
*EVE 280  06:28  52 33.57  131 32.25 ! Tape # 14
*
*EVE 281  06:41  52 34.02  131 35.31 !
*TRA END
*
*EVE 282  06:47  52 33.56  131 35.23 !
*TRA   J12     307    320    840   2.197 105.579   0.217  10.140

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 14   840   4.1   3.8 116.4 111.4  61.0  56.2   2.0 3.16E-04 3.53E-02 1.33E+02
286 17160  80.6  74.7 128.1 123.1  27.8  85.4   0.0 3.28E-03 4.04E-01 3.02E+04
```

```
*EVE 283  07:00  52 32.97  131 31.75 !
*TRA   J13     321    354   2040   5.469 128.037   0.567   9.652

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 34  2040  10.1   9.4 127.1 122.1  65.2  66.8   3.3 1.40E-04 1.71E-02 1.60E+02
320 19200  90.8  84.0 128.0 123.0  28.0  85.3   0.0 2.94E-03 3.61E-01 3.04E+04
*
*EVE 284  07:34  52 29.60  131 24.67 !
*TRA   J14     355    373   1140   3.013  77.928   0.333   9.038

 N     P   Len  Area  Rang   Col   Dcs   Dcb   Lcb    Vol D   Surf D  Biomass
 19  1140   5.6   5.2 103.6  98.6  71.5  22.9   1.6 1.68E-04 1.66E-02 8.58E+01
339 20340  96.3  89.2 126.6 121.6  28.1  85.1   0.0 2.81E-03 3.41E-01 3.04E+04
*
*EVE 285  07:54  52 30.23  131 19.83 ! End of Sounding grids
*TRA END
*
*EVE END
*
*ICO KE:
*EXI
```